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New Power on the Feather . . . 88

# ELECTRICAL WEST

July 1958
50 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

20/34.5 Kv—An Economic Solution 54

**How Not to Grow an Ulcer . . . . . 53**
**Preventive Maintenance . . . . . 64**
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**Public Relations—**
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# WILL THE NEW HOME YOU'RE BUYING OFFER THESE 4 GUARANTEES ?

*(Every Medallion Home does... yet costs you no more!)*

**Medallion Home Guarantee #1**

***Basic electric appliances already built in.*** They're part of the original house plan—not out-of-pocket extras. They're placed to afford you a maximum of electrical convenience.

**Medallion Home Guarantee #2**

***Provisions for proper lighting.*** Eye-saving lighting that is both decorative *and* functional – carefully planned and located when and where you need it.

**Medallion Home Guarantee #3**

***Ample wiring for present–and future–needs.*** Plenty of Housepower to accommodate today's appliances plus those you'll want tomorrow. The wiring is already in and paid for.

**Medallion Home Guarantee #4**

***Insured resale value.*** Because tomorrow's living will be electrical living, a Medallion Home will be modern for years to come. Your investment is protected.

***No other home at comparable cost can offer the advantages of a Medallion Home***

Two out of three homes being built today are electrically obsolete the day you move in.

Yet it costs you no more to own a Medallion Home—a new home awarded the Medallion symbol by your local electric utility. This is your *guarantee* that it is ready today for tomorrow's high standard of electrical living. Loan agencies state that homes equipped with Medallion provisions stand little chance of losing their value due to obsolescence.

Before you invest your money in *any* home, drive out to see one that has been awarded the Medallion Home symbol. See how practical it is to live *better* electrically.

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY

**SMOOT-HOLMAN**

your

best source

for

"tomorrow's lighting today"

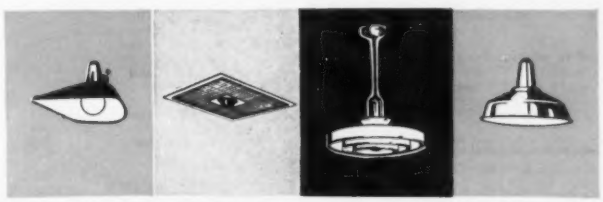
**TWIN-LUX:** Versatile unit meeting many decorative requirements.

**PERFECT VISION:** A Smoot-Holman exclusive for quality illumination at low cost.

**SHALLOLITE:** Outstanding styling coupled with top lighting performance.

**INDUSTRIAL FLUORESCENT:** Quality construction designed to RLM standards.

**A complete selection of commercial fluorescent, industrial fluorescent, commercial incandescent, industrial incandescent and outdoor flood lighting equipment.**



**PROPER LAYOUT MADE EASIER!** Send for your FREE Smoot-Holman "Lighting Guide" ...and auto-calculator to compute the required lamps and fixtures for most commercial and industrial interiors.

Certified Lighting

**SMOOT-HOLMAN COMPANY** • *Inglewood, California*

# ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U.S. Established 1887



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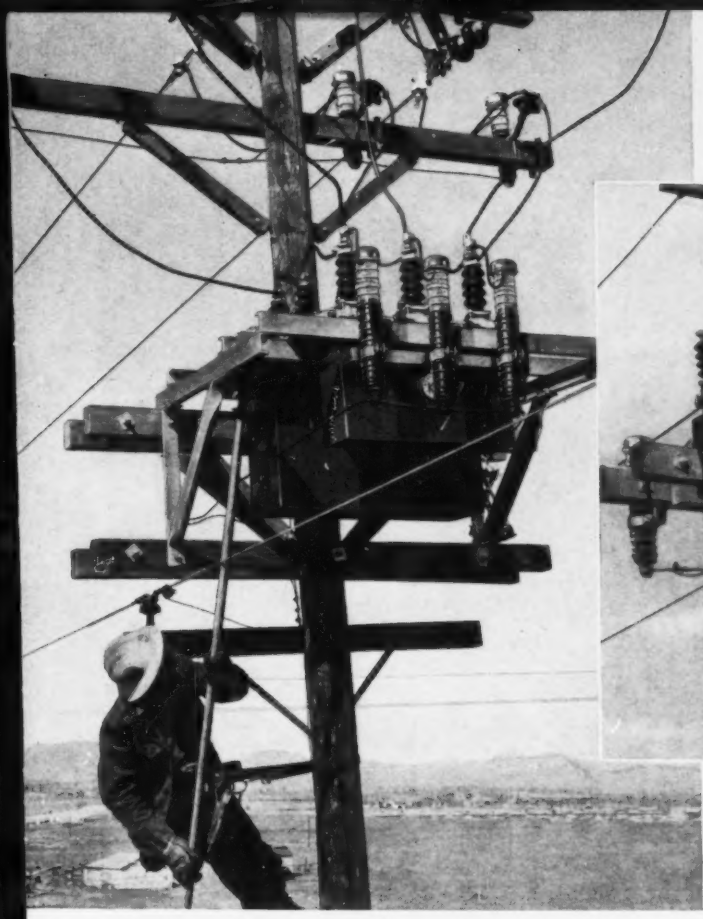
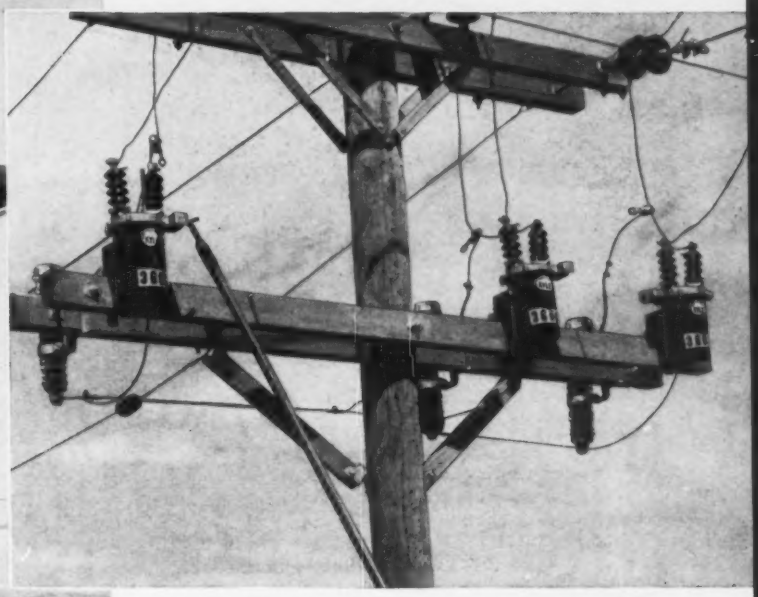


THREE-PHASE 185-ampere Kyle Type R recloser with 200-ampere ground tripping protects the main circuit from faults on a 3-phase branch line in Denver.



THREE 140-AMPERE single-phase Kyle sectionalizers protect the main feeder from faults on short branch lines, and also sectionalize areas behind reclosers. These are operated either by recloser or station breaker.

### Report From Public Service Company of Colorado...

# Standard Recloser Application Program Conserves Time For Utility's Engineers

**Fundamental plan simplifies application of reclosers and sectionalizers; conserves engineering, record-keeping, and storekeeping time; gives better conductor protection.**

A standard application plan for reclosers and sectionalizers offers many advantages. With a predetermined program, this equipment is selected and installed according to the plan, without any further engineering.

Basically the plan consists of selecting certain ratings of reclosers and sectionalizers to be applied to branches according to load, line length, and exposure. The plan automatically assures adequate protection against burndowns, gives better assurance of service continuity, and insures coordination.

Public Service Company of Colorado is an outstanding example of a utility with a fundamental protection plan. According to Messrs. Hayden, Martin, and Tilson, electrical engineers for P.S. Company, in the first year "savings in engineering time, record-keeping, and storekeeping have been so obvious as to warrant considerable enthusiasm. Also field experience so far has been most gratifying, because it has indicated that definite and concrete operating benefits have been and will continue to be enjoyed as a result of this plan."

This and other programs provide for complete flexibility. In the original program, any ratings and sequences that engineering prefers are selected. Thereafter the plan is applied automatically. The plan provides for switching or dividing load areas or feeders, and for taking care of increasing loads.

**Ask Us For Details**

Bulletins on Kyle Reclosers and a copy of a paper on the Colorado plan are available. We'll be glad to supply you with copies. Ask the L-M Field Engineer, or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

McGRAW EDISON

**LINE MATERIAL Industries** Kyle® Reclosers

McGRAW-EDISON COMPANY

337

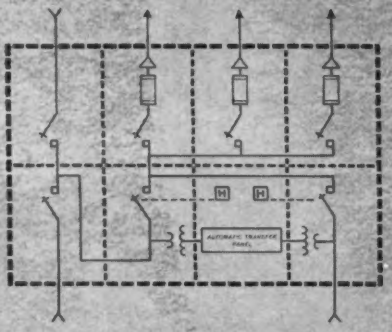
# for high voltage service continuity on your critical loads at lower capital outlay— it's S&C Metalclad Switchgear!

To get service continuity on critical loads, you need preferred-to-emergency switching of your alternate incoming high-voltage supply circuits, and short-circuit protection and switching on your outgoing high-voltage supply feeders. All of this can be provided in one low-cost package in S&C Metalclad Switchgear, as illustrated.

You even have built-in choices of throwover schemes through S&C's standard automatic transfer panels.

You save two ways:

1. You get metalclad switchgear with job-matched load interrupters and power fuses, in lieu of costly circuit breakers.
2. You eliminate cost of custom designing by using an off-the-shelf transfer panel with built-in options.

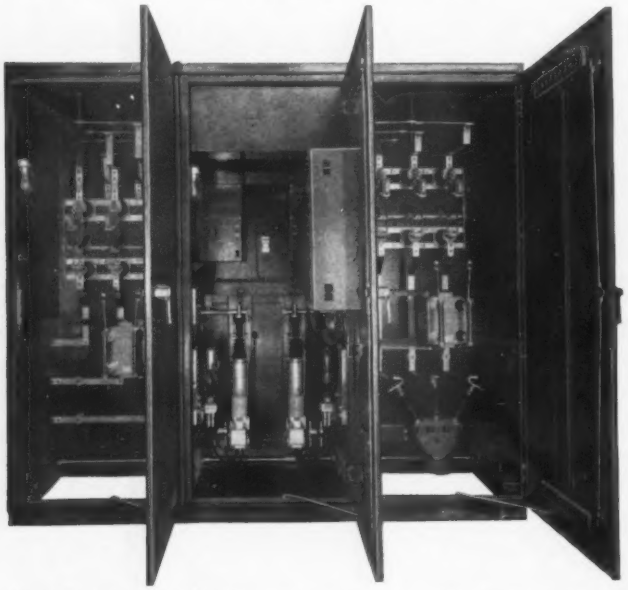


Schematic for 8-bay switching center unit (above) shows throwover control of 2 of 3 alternative incoming sources to provide continuous service for three outgoing feeders.

No organic insulation to cause corona trouble; porcelain and air only.

High-Speed Automatic Switching.

Full-length bulkhead doors; rainproof, with complete access.



S&C Standard Automatic Transfer Panel provides for making either source preferred, for automatic or manual return, for adjustable time delays, for choice of returning in either open or closed transition, and for optional lockout on bus faults.

Super Durabake finish with galvanized and stainless steel hardware; withstands corrosive atmospheres.

Separate compartment for Moto-Draulic operators; free access and decoupling for checkout.

Strip heaters with adequate venting prevents moisture accumulation.

Power Fuses
Tool-Operated Disconnects
Open and Enclosed Cutouts
Fuse Links
"Loadbuster"
Load Interrupters
Metalclad Switchgear

**S&C ELECTRIC COMPANY**
4425 Ravenswood Ave., Chicago 40, Ill.

In Canada: S&C Electric Canada, Ltd.
8 Vansco Road, Toronto 14, Ontario

## Construction Highlights

Hilton Hotel in Portland, Ore., to cost $10,000,000.

Business-convention center, with hotel, auditorium and exhibition hall near Disneyland, Anaheim, Calif., $15,000,000.

Family housing of 856 units, Fort Lewis, Wash., $14,000,000.

Broadway-Hale department store, Sacramento, Calif., to cost $5,000,000.

Apartment house project in San Francisco, Calif., to cost $10,000,000.

Nine-story addition to California Hospital, Los Angeles, Calif., $3,000,000.

High voltage transmission line, Cooper Lake Hydroelectric Project, Kenai Peninsula, Alaska, $12,500,000.

Ferry terminals at Lopez, Anacortes and Roche Harbor, Wash., $450,000 each. Total: $1,350,000.

Foothill Junior College District, Los Altos, Calif., approved bonds for a new college on 100-acre site. Cost: $10,400,000.

Portland, Ore., voted three-year levy to raise $1,650,000 annually for school construction. Total: $4,950,000.

Expansion program, religious college, Berkeley, Calif., $4,000,000.

Apartment building, Seattle, Wash., $3,000,000; Oakland, Calif., $2,000,000.

Chemistry Building, WSC, Pullman, Wash., $2,000,000.

Housing development, Lynnwood, Wash., 80 homes to cost $1,200,000; shopping center, $2,000,000.

Three-story laboratory building at Scripps College, La Jolla, Calif., $1,600,000.

Student housing at Central Washington College of Education, Ellensburg, $1,260,000.

New school construction in Torrance, Calif., $1,600,000.

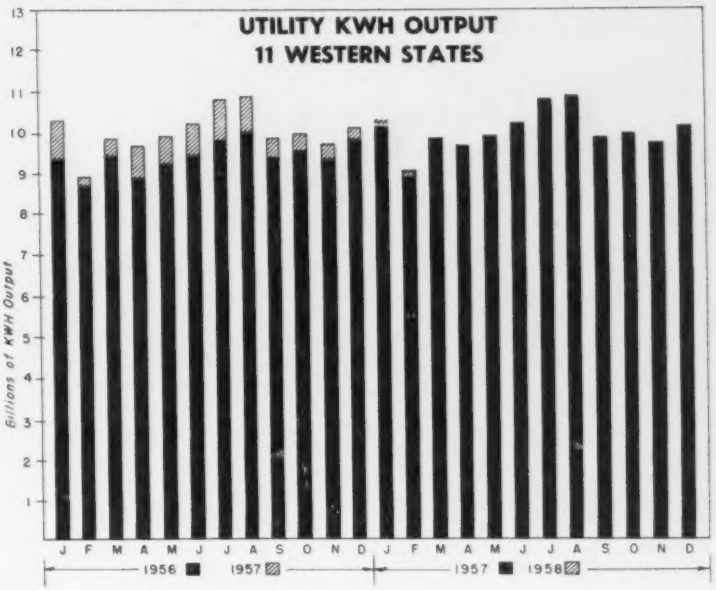
279 new Eichler homes, Sunnyvale, Santa Clara County, Calif., $6,250,000.

REA loans of $1,775,000 to Central Electric Cooperative, Redmond, Ore., for new lines and substation; of $200,000 to Plumas-Sierra Rural Cooperative for 26 miles of line and additional substation capacity.

New plywood plant at Coos Bay, Ore., to be built by Georgia Pacific, $2,000,000.

Pueblo, Colo., voted bonds for school construction, $7,750,000; Lakewood, Colo., voted bonds for school additions and construction, $9,940,000.

# ----How're We Doing?




## Output Comparisons

Year-to-year Kwh Output Changes in Western Regions and U. S.
Per Cent Changes Over Same Week One Year Ago

| Week Ending | Rocky Mountain | Pacific Southwest | Pacific Northwest | U. S. Total |
|---|---|---|---|---|
| May 3 | +2.1 | +2.3 | — 6.6 | —0.3 |
| May 10 | +5.9 | +3.1 | — 8.2 | 0.0 |
| May 17 | +6.1 | +5.2 | — 7.6 | —2.3 |
| May 24 | +9.4 | +9.2 | —12.4 | —2.2 |

## Better Construction Outlook

At the end of May, the **proposed engineering construction in the United States totaled just over $112 billion,** of which $27.7 billion (24.7%) were in the 11 Western states. King-size projects that swelled the Western total last month included the $25,000,000 ICBM Missile Base to be built near Spokane, a $50,000,000 hotel and office project for downtown San Francisco, a new $10,000,000 junior college near Los Altos, Calif.

**FHA mortgage applications in May broke historical records when they pierced the 90,000 mark. . . .** Heavy construction contract awards according to Engineering News-Record, climbed again in May to score the fifth consecutive monthly increase and, in dollar volume, crowded the all-time high figure reached in December 1950.

**Industrial spending for plants and equipment has been trimmed back to a $30.8 billion annual rate,** 17% under the 1957 actual outlay, according to a report issued by the U. S. Department of Commerce early in June. Electric and communication utilities plan to spend more but other segments of the industrial economy have trimmed plans. For example, railroads have cut back 47%, textile mill products 38% and motor vehicles and equipment 35%.

Fluor Corp. Ltd. has been awarded a contract to engineer and construct a 55,000 bbl-per-day (total feed) Esso Model IV, fluid catalytic cracking plant for Standard Oil Co. of California, Western Operations Inc., at its Richland, Calif., refinery. The project will include gas recovery, hydrogen sulfide treating and caustic wash units and a CO boiler. Construction began in June, with completion scheduled for the summer of 1959.

# EW news roundup

**42 MILLION KW**—Scheduled production of generating equipment by manufacturers for the three-year period 1958-1960 totals more than 42,000,000 kw. This is one of the findings of the most recent annual electric power survey made by EEI. Predicted December peaks for the utility systems as a whole are 120,000,000 kw in 1958, 129,000,000 kw in 1959 and 138,000,000 kw in 1960. According to the survey, nearly 16,000,000 kw of new capacity will go into service this year.

—EW—

**MONEY OBSOLETE**—A Cleveland electronic concern predicts that the use of cash, coins and checks probably will be obsolete by 2025. Instead the citizen will carry an electronic pocketbook in the form of a laminated metal card about the size of today's driver's license.

The card will contain a complex network of printed circuitry, including a coded identification number. Instead of a pay check, wages will be posted on the employee's electronic pocketbook by the employer by a device wired to a central bank clearing house. It will deduct a similar amount from the corporate electronic pocketbook there.

Each time a purchase is made, the store will withdraw the amount from his "electronic deposit" by the use of the card; at the same time add to its electronic account. Those who pay by mail will slip their electronic pocketbook into a specially adapted telephone which will transmit the owner's code number and the amount to the proper party. Nothing was mentioned about electronic overdrafts.

—EW—

**SPHERICAL MOTOR**—A squirrel-cage a-c motor with the possibility of infinite speed control has been developed at Manchester University in England. The new squirrel-cage motor abandons the cylindrical shape of the conventional squirrel-cage rotor, both the rotor and the stationary winding of the new machine being made in spherical form. A complete network of conducting bars, set at right angles to each other, has been embedded in the spherical surface of the rotor. The angle between the stationary field and the direction of rotation of the rotor is varied to obtain the infinite speed variation.

—EW—

**SIGNS OF THE TIMES**—The Monongahela Power Co., in its area development program, is touting used mines in West Virginia as ideal manufacturing sites—particularly in the atomic age.

—EW—

**The design power level of 20,000 kw of heat was reached by the Sodium Reactor Experiment of Atomics International on May 21. Southern California Edison Co. purchases the heat for an adjacent 6,000-kw generating station.**

—EW—

**"SAKI"**—No, it's not the name of a Japanese intoxicant but it's the title given to the first electronic teacher. Introduced in Great Britain, it trains operators for punch card systems. "Saki" stands for Solartron Automatic Keyboard Instructor and it is a teacher in the fullest sense of the word, taking the pupil step by step from a novice to a full-speed touch operator in 18 hours instead of the normal 50-hour training period. It even paces itself to the learning rate of the student.

In operation, it asks the pupil to punch certain numbers by flashing lights behind those numbers. At the start "Saki" answers by lighting the correct lights of the student's response. Later on the lights do not appear until after a few seconds' delay or if a wrong key is pressed.

**LIGHTING COMPUTER** — The Smoot-Holman Co. has built an analogue computer that scientifically determines room lighting requirements for all different types of areas, fixtures and reflecting surfaces. The new computer also is an aid in fixture design, in planning lighting arrangements and in solving research problems in connection with lighting applications.

—EW—

**COMIC SALES TOOL**—The Better Light Better Sight Bureau has created a comic book for use by utilities in stimulating consumer interest in good home lighting. The publication tells of the activities of Sherlock Ohms and Dr. Watts who solve "The Case of the Unknown Quantity." The comic book is available for promotional use in quantity through the Better Light Better Sight Bureau, 420 Lexington Ave., New York 17, N. Y., at prices which begin at $42 per thousand plus a small charge for imprinting company identification on the comic book.

—EW—

**BREAK-THROUGH**—Perhaps it is significant that the 100,000,000th kw of investor-owned electric company generating capacity was added by a Western utility company.

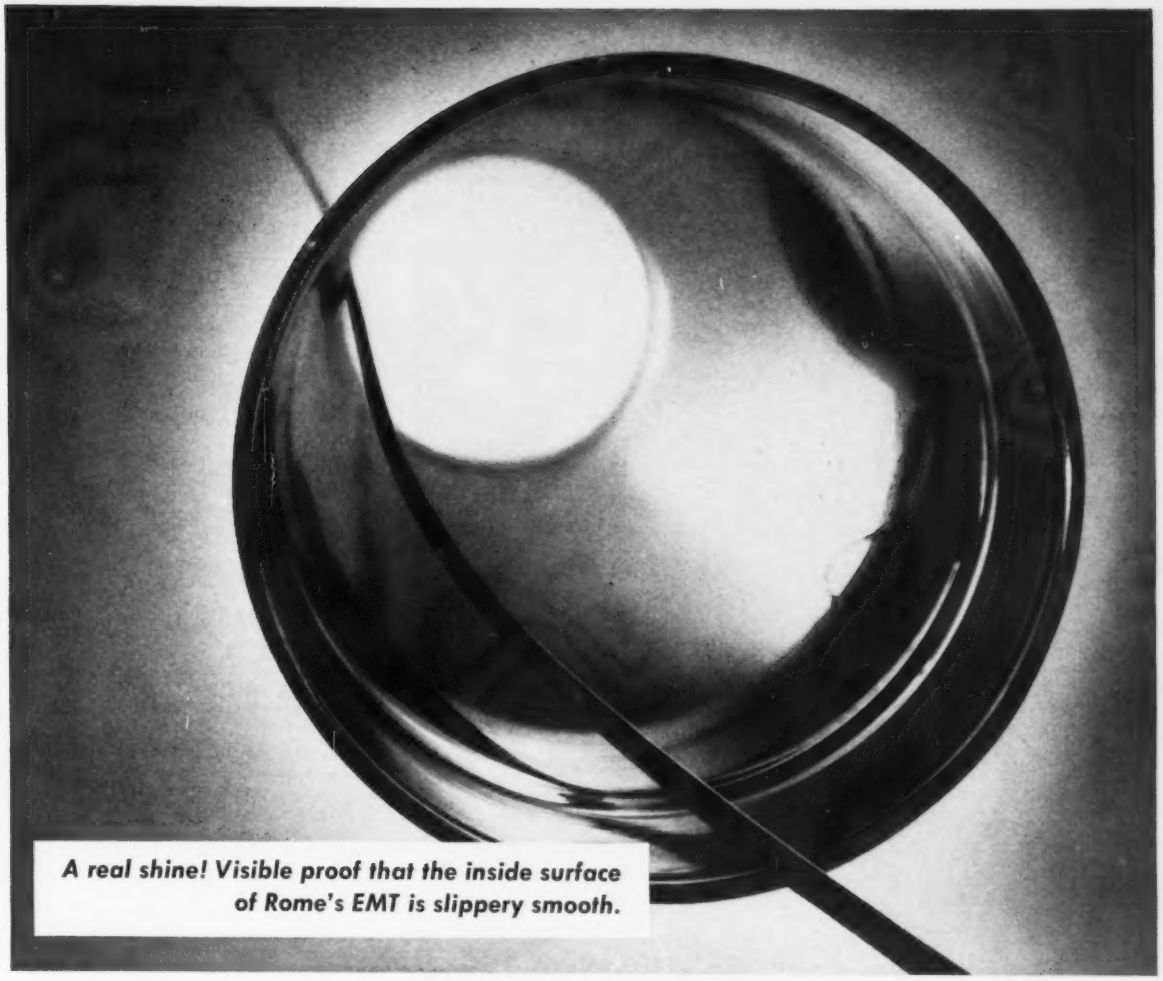
Tucson Gas, Electric Light & Power Co. put a new 75,000-kw generator on line May 11 to go over the hump of 100,000,000 kw, according to Edison Electric Institute.

Total utility industry generating capacity was 130,356,000 kw as of March 31, about double what it was at the end of 1950.

—EW—

**NEW LOOK**—The Seattle Fire Department is discarding the traditional fireman's ax in favor of electrically powered saws, drills and hammers.

"It takes firemen from 8 to 11



*A real shine! Visible proof that the inside surface of Rome's EMT is slippery smooth.*

# "Tape's eye view" shows why Rome's EMT is easiest to fish

**That shine you see is the reason fish tape won't "hang up" when you use Rome's EMT.**

The slick interior finish of Rome's EMT lets your fish tape slide through with an absolute minimum of resistance. Careful baking—under rigid control—produces a uniformly smooth enamel-like finish inside Rome's EMT.

In a test conducted by the Anstice Company, a completely unbiased party, Rome's EMT came out first in fishability. Three ten-foot lengths of ½" EMT, Rome's and two competitive samples, were formed into identical figures containing eight bends. The ⅛" fish tape used in the test easily passed through the eight bends in Rome's EMT, but "hung up" on one of the bends in both competitive samples.

**Strong weld** In another test to determine the strength of the weld on Rome's EMT, a sample was squeezed, flared, flattened, and expanded. In each case, the weld proved to be as strong as the metal itself.

**Easy bending** The strength of Rome's EMT interferes in no way with its ductility. You can make bends—even intricate ones—quickly and easily.

**Corrosion resistance** A uniformly electrogalvanized exterior finish protects your installation against corrosion. Long dependable service life is assured.

Use easy-fishing, easy-bending Rome EMT on your next job. Contact your nearest Rome Cable representative for more information—or write to Department 905, Rome Cable Corporation, Torrance, California.

**ROME CABLE**
CORPORATION

have your

Westinghouse representative

tell you how you can

CHANGE OUT A

DISTRIBUTION

TRANSFORMER

AT THE BREAK-EVEN POINT

Now—an indication to show when the loading on a pole-type distribution transformer has reached economical change-out point on conventional or protected units . . . Another answer to meet a changing need—made possible because Plowback of earnings into research maintains Westinghouse leadership in distribution transformer development.

J-70847

YOU CAN BE SURE...IF IT'S

Westinghouse

minutes to chop through a typical laminated floor under smoke and fire conditions," said Assistant Fire Chief Robert Rogers, in explaining the change. "It takes only a minute or two with an electric tool."

Enough said.

—EW—

**RECHARGING**—To heighten their ability to teach science and mathematics, 300 school teachers will return to college campuses for six weeks this summer on fellowships provided by the General Electric Educational and Charitable Fund.

The teachers, selected from 38 states, have been awarded expense-free summer fellowships in six universities and colleges.

The fellowship programs were started by G-E 13 years ago.

—EW—

**COMERS** – Electrical engineering students from California State Polytechnic School have won the prize paper competition of the AIEE for the Arizona-California-Nevada district for the third consecutive year.

Winning students were Adrian R. Wilson, San Jose; and Robert A. Mintz, Grover City. Both will work for Westinghouse following their graduation in June.

—EW—

**MONEY MAKER**—Stripping insulation from aluminum conductor raises the scrap value from $2.50 cwt to $12 to $14 cwt. Public Service Co. of Colorado has invented a machine that strips the insulation at the rate of 40 ft per minute in order to get the price advantage. The stripper is adjustable for any gage wire.

—EW—

**GIANT** – A mobile power transformer with a capacity of 40,000 kva, believed to be the world's largest, will be delivered to Pacific Gas and Electric Co. late this year.

The mobile transformer can be hauled by tractor, and will serve as a mobile spare for many large transmission stations on the PG and E system.

It will take 230-kv power from the transmission system and step it down to 120 or 60 kv. It will have a tap changer to adjust output voltages. Oil-to-air heat exchangers, control cabinet and lightning arresters will also be mounted on the trailer, which is a jointed, double-truck ve-

hicle with 32 wheels. General Electric is building the unit.

—EW—

**SAFETY NOTE** – A nuclear research reactor increased its power from zero to 530,000 thermal kw in less than a second, shutting itself down without sustaining damage. This is the largest rate of power increase known to have been experienced safely in a reactor. The special test was made to demonstrate the inherent ability of the reactor to shut itself down without the use of auxiliary control rods or devices when abnormal operating conditions occur. The test was made in an aqueous homogeneous reactor operated by Atomics International.

—EW—

**The law of triviality, as expounded in Professor Parkinson's new book, Parkinson's Law, states that in conferences the time spent on any item of the agenda is inversely proportional to its importance.**

—EW—

**CORNCOB USE**—Army Engineers use ground corncobs in a sand-blasting machine to clean the generator windings of hydrogenerating units being overhauled at the Bonneville power house. Ground walnut shells, conventional cleaner for operations of this kind, are considered too harsh for the insulation of electrical machines. The corncob offers a cleaning action that is not abrasive but leaves the winding in a condition that permits a new coat of varnish to be applied without further processing.

—EW—

**IT'S HERE**—Now being tested is an auto radar that automatically warns the driver of traffic hazards by emitting a Sputnik-type "beep-beep." It's a development of the Bendix Aviation Corp. research laboratories and may be the forerunner of automatic safety devices that will save the driver from himself.

—EW—

**ELECTRICAL MUSCLES**—In the EEI 1958 edition of "I Want to Know About the Electric Industry" a measure of the rapidly increasing electrical component of manufacturing production is tabulated. Between 1946 and 1956 the average annual kilowatt-hours used per worker grew from 10,000 to nearly 25,000. During the same period the kilowatt-hours used per man-hour jumped from 4½ to 8.7. For more information about the booklet itself write EEI, 750 Third Ave., New York 17, N. Y.

—EW—

*We just ran across a resolution adopted by the Committee on Engineering Education of the American Society of Civil Engineers. Amidst a flurry of "whereases" and "now therefores," they urge the full 12-month use of all educational facilities rather than the 9- to 10-month use that is common today. Seems like a swell idea, and now might be a good time for some of the other societies to lend support.*

—EW—

**G&T CO-OPS AVERAGE 33,000 KW**—M. A. Chase, REA engineer, speaking before the AIEE, told the group that in 1950 generation from internal combustion engines represented almost 60% of the total REA generating capacity. By 1957, steam represented 70% of the generation.

"In the next two years," he reported, "about 500,000 kw of additional steam capacity is expected to go into operation on projects now under way. This will raise total steam capacity to about 1¼ million kw. The average size of the 15 steam units now being installed is more than 33,000 kw . . . during 1956 the average size steam unit in operation was less than 10,000 kw, and the largest single unit was 30,000 kw."

—EW—

**GOOD PROSPECTS**—A New York realty firm estimates that 1,400 shopping centers worth $3 billion will be built in the U. S. in the next two years—largely as a result of the expanded highway program. Food store chains plan to build 2,000 new supermarkets and to remodel 1,700 others for a total cost of $635,000,000. There ought to be a pretty good share of electrical business in this expansion.

—EW—

**STREET LIGHTING**—Street lighting from Colonial times to present-day advances is the subject of a new color movie now available from the

Now . . .
stop line outages
caused by birds
and squirrels . . .

NEW PLASTIC-COATED COVERS ON WESTINGHOUSE DISTRIBUTION TRANSFORMERS

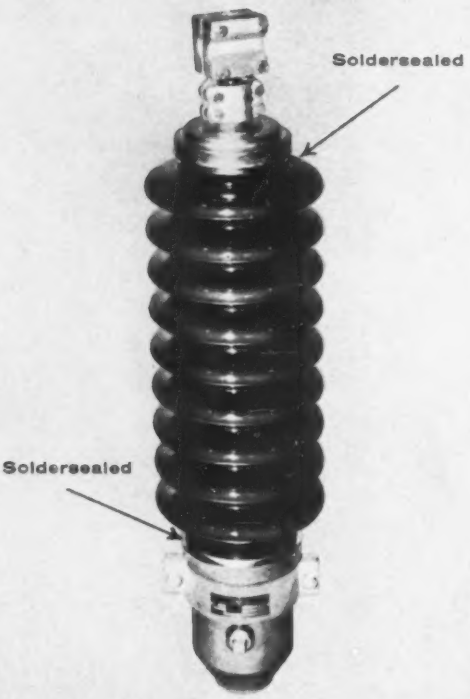
Have your Westinghouse representative give you the full story about . . . another answer to a changing need.

J-70845

YOU CAN BE SURE...IF IT'S
Westinghouse

# Why more and more utilities are adopting Anaconda Soldersealed Potheads

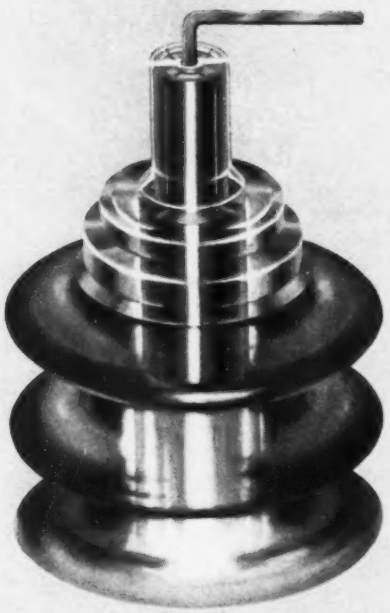
## NO GASKET




**TODAY'S TREND TO** more severe load temperature cycles demands potheads of greater tightness and reliability than ever. That's one reason more and more utilities are standardizing on Anaconda Solderseated Potheads. Leakproof Anaconda Solderseated Potheads will stand these more severe load cycles—there are no gaskets to tighten . . . all connections are soldered . . . with the difficult seals between porcelain and copper fittings *made in the factory*—not in the field! No moisture can be sucked into the pothead during cool part of load cycles. Outages and maintenance costs are reduced. Installation is sure and easy. Illustration above shows Anaconda Solderseated Pothead, 46-kv voltage rating.

*Anaconda Solderseated Potheads are available in 1/C type up to 46 kv for indoor or outdoor service—stocked, ready for delivery. Write for Bulletin C-79-1330. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.*

## UNIQUE DOUBLE ACTION CONNECTION



**ANACONDA SOLDERSEALED POTHEADS** are now made with an exclusive Double Action connection that eliminates the possibility of faulty field installation. This Double Action electrical connection is achieved by expanding the slotted stem against the inside of the copper hood and by the clamping action of aerial lug on the outside of the hood. Here's what else Anaconda's Double Action connection does: (1) prevents misalignment of cable during wiping and filling operation, (2) produces a permanent, sure electrical connection, (3) enables pothead to be easily dismantled and reinstalled, (4) eliminates possible damage to hood. Phantom drawing above shows how connection is made. 58334

**FASTEST WESTERN SERVICE** — At Orange, California, Anaconda's expanded, modernized mill fabricates and stocks copper and aluminum wire and cable for *every type of application.* Anaconda assures the fastest possible service on all West Coast needs. See Anaconda Sales Offices: Los Angeles, San Francisco, Seattle, Denver.

LIVE BETTER ELECTRICALLY

SEE THE MAN FROM **ANACONDA®**

FOR **SOLDERSEALED POTHEADS**

film library of Aluminum Co. of America.

Designed for showing before street and highway engineers, chambers of commerce, civic groups, and traffic and transportation safety committees, the film may be borrowed by writing: Motion Picture Section, Aluminum Co. of America, Alcoa Building, Pittsburgh 19, Pa.

—EW—

**ON RUSSIAN CULTURE** – Dr. Crawford Dunlap Jr., Bendix Aviation Corp., made a piercing observation regarding intellectual and educational levels in Russia. Dr. Dunlap pointed out that, " 'Highbrow' presentations such as drama, opera and ballet form the greatest part of Russian entertainment. Publications such as comic books, confession magazines or tabloid newspapers don't exist. The Russian man-on-the-street must take intellectual reading fare or go without. Book reading is a standard avocation, and 'heavy' novels are as likely to be read by the elevator operators and floor maids in the hotels as are the lighter magazines."

How can you co-exist with people who read books?

—EW—

**. . . AND OUT WEST**—Congratulations to Fremont L. Roe, staff consultant, engineering department, Salt River Power District, Phoenix, Ariz., on being elevated to the grade of Fellow in the AIEE. Mr. Roe's citation read . . . "for contributions to electric power system development in pioneer territory."

—EW—

**A recent squib in the "Oregon Voter" takes present-day existing generating facilities in the Pacific Northwest as 9.8 million kw, made up of 5.3 million federal and 4.5 million nonfederal. Looking ahead at capacity under construction or licensed, there are 2.6 million kw of federal generation and 4.5 million kw of nonfederal capacity.**

—EW—

**A complete "sellout" of exhibition space for the 1958 Western Electronic Show and Convention, Aug. 19-22, was reported by Hugh P. Moore, WESCON show director. Moore said that all available booth space in the Pan Pacific Auditorium in Los Angeles – plus three giant exhibition tents– has been assigned to exhibitors.**

—EW—

*The study of human relations by those engaged in engineering leadership and management "may well be as important" as keeping abreast of technical and economic problems, according to Lee Kilgore of Westinghouse Electric Corp., East Pittsburgh. "It is in the area of motivation and human relations that many of us need to give considerable thought if we're going to lead our engineers to make the most of their potential abilities."*

—EW—

**Federal Pacific Electric Co. recently concluded a manufacturing agreement with English Electric Co. Ltd. whereby Federal Pacific will manufacture protective relays, based on English Electric designs, for the American utility and industrial markets. Federal Pacific becomes the third domestic firm to produce this type of control equipment.**

—EW—

**LIGHT EDUCATION** – Development of an electric lamp home study course has been announced by Sylvania Lighting Products. The eight-lesson course covers the principles, characteristics and applications of incandescent, fluorescent and mercury vapor lamps.

Registration may be made by writing to David C. Lash Jr., manager, sales training, Sylvania Lighting Products, 60 Boston St., Salem, Mass.

—EW—

**SOLUTION**—Frank Raglin, superintendent of transportation for Public Service Co. of Colorado, has sent us the solution to a perennial nuisance. Aerial ladders have been severely damaged repeatedly by drivers operating the trucks with the ladder up even with warning devices usually offered.

Following an employee suggestion, a system was developed whereby the ignition circuit must be completed through both the ladder switch and a clutch pedal switch. If the ladder is not down and the clutch is depressed, the engine will stop. See how simple it is?

—EW—

*"Nighttime living," said John W. Young, Massachusetts lighting consultant, "has brought social and economic changes—shopping and entertainment centers, public gatherings and rising annual vehicular mileage —which all make necessary greater attention to street use under artificial illumination." By way of proving the point, Young pointed out that of the 372,000 miles of urban roadways, only 7.2% are lighted to the minimum standards.*

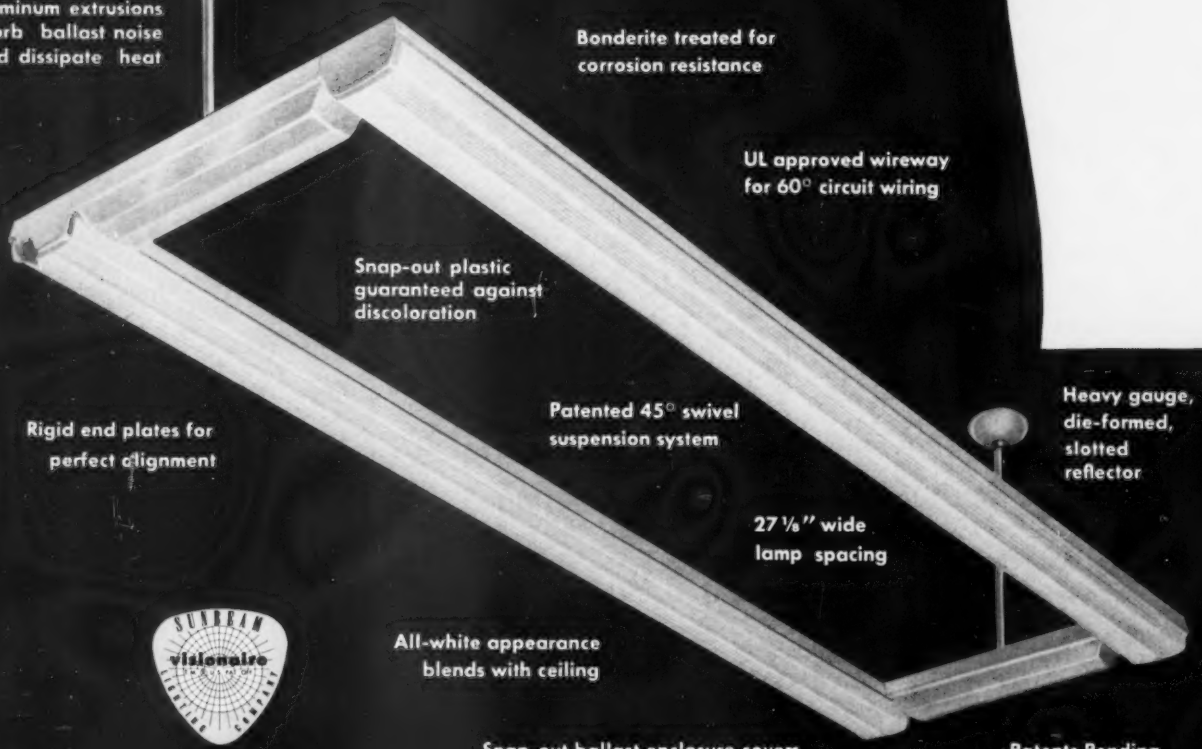
## How Not to Grow an Ulcer

| | | True | False |
|---|---|---|---|
| 1. | Just ignore problems and they will go away. | ..... | ..... |
| 2. | There's no humanity in business. One mistake and you're dead. | ..... | ..... |
| 3. | Always hold a finished job for a day or two—a better solution may occur. | ..... | ..... |
| 4. | Engineers are criticized more than they deserve. | ..... | ..... |
| 5. | Get the simple jobs out of the way, then you can concentrate on the tough ones. | ..... | ..... |
| 6. | It's best if you can plan how you might react in any business situation. | ..... | ..... |
| 7. | To admit a misake admits failure. | ..... | ..... |
| 8. | The trouble with the world is people. | ..... | ..... |
| 9. | I can handle my job. | ..... | ..... |
| 10. | Fate is an adversary. | ..... | ..... |
| 11. | Subordinates can tell if you are facing a problem. | ..... | ..... |

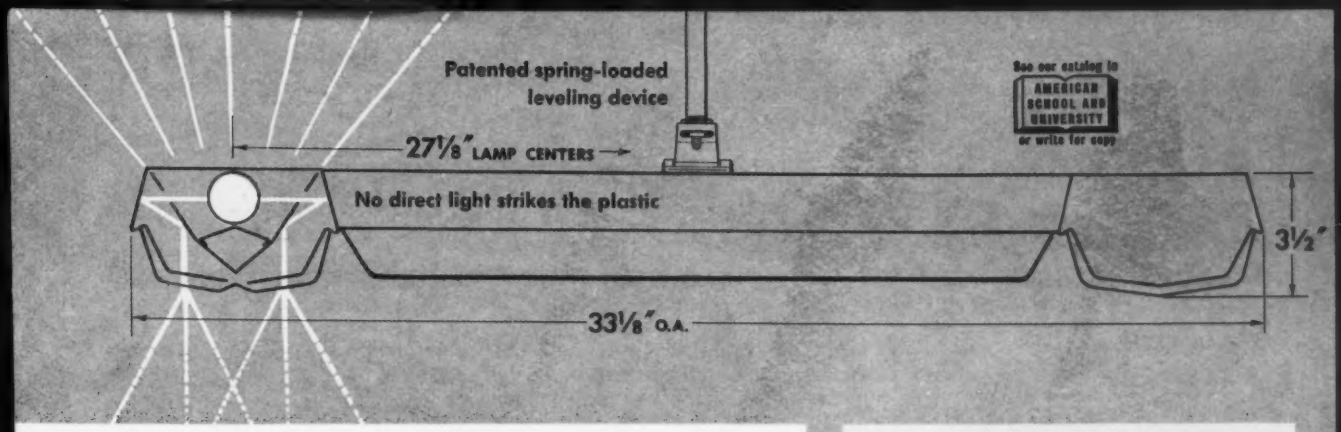
(Answers on page 53)

# *Sightline*® FOR SEEING COMFORT

## A TOTALLY NEW INDIRECT LIGHTING SYSTEM


Aluminum extrusions absorb ballast noise and dissipate heat
Bonderite treated for corrosion resistance
UL approved wireway for 60° circuit wiring
Snap-out plastic guaranteed against discoloration
Rigid end plates for perfect alignment
Patented 45° swivel suspension system
Heavy gauge, die-formed, slotted reflector
27 1/8" wide lamp spacing
All-white appearance blends with ceiling
Snap-out ballast enclosure covers
Patents Pending

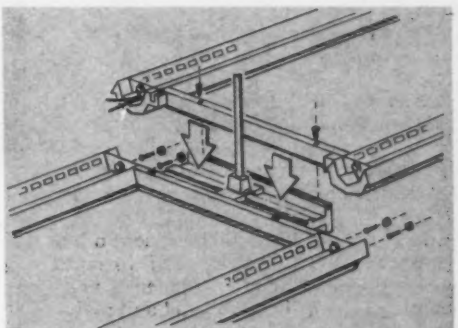
SUNBEAM visionaire LIGHTING COMPANY




A truly integrated, totally indirect lighting system, Sunbeam SIGHTLINE® is engineered to produce high intensity illumination with minimum "overhead" contrasts resulting in the most comfortable, glare-free seeing conditions. This is especially important in areas where visual tasks are critical. SIGHTLINE® excels in every respect to ASA School Lighting Standards. Crisp, clean, airy styling and thin, widely spaced cross channels of the all-white SIGHTLINE® system blends inconspicuously with most interiors. High efficiency of 82%, extremely low brightness of less than 100 ft-Lamberts on ribbed plastic diffuser and minimum maintenance means long-term economy. No direct light strikes the snap-out plastic assuring long life and freedom from discoloration.

The extruded aluminum cross channels provides more than solid support to the SIGHTLINE® system. They also effectively minimize ballast hum and dissipate ballast heat. A strong, test-proven suspension system with patented 45° swivels top and bottom allows maximum installation flexibility. An aluminum-alloy casting at the bottom incorporates a spring-loaded, self-leveling device and a finger-controlled fine vertical adjustment feature. For utmost simplicity, the SIGHTLINE® is easily ordered by complete rows as required by room size and lighting level desired.

*Don't write your next "spec" until you've seen our complete brochure #A-2a.*



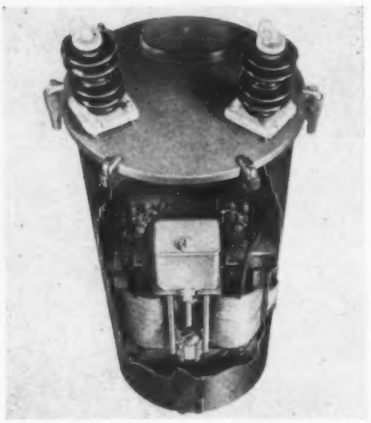
Continuous rows easily achieved by interlocking sections to extruded aluminum support channels and bolting fixtures together.

**Absolutely no glare, either direct or reflected, comes from SIGHTLINE® illumination. SIGHTLINE® illumination permits maximum visual acuity with no loss of contrasts at seeing task. SIGHTLINE® excels in every respect to ASA School Lighting Standards.**

**Sunbeam Lighting Company, 777 East 14th Pl., Los Angeles 21, California & Gary, Indiana**

# PRODUCT NEWS

## New Designs and Applications



Cutaway view of Line Material's new SRT self-regulating distribution transformer, showing how the regulating features are integrated into the standard tank design

### SRT—First Self-Regulating Distribution Transformer

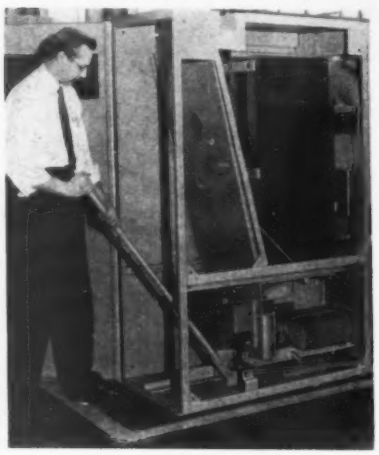
(1) *Line Material Industries, Milwaukee* 1, *Wis.*

Development of a self-regulating distribution transformer was disclosed by President R. G. Wheaton at a meeting of utility executives and industrial editors in Chicago late last month. Designated SRT, the new transformer has been designed to improve electric service and increase consumer satisfaction. It senses voltage at the utilization level and maintains an average secondary voltage of 120 v by actuating a tap changer connected to the primary winding.

The SRT is a standard round-wound transformer with additional integral features to make it self-regulating. Regulation is accomplished by automatically changing the transformation ratio in 2½% steps over a voltage range of 10%. Effective band width is 3½ v centered around a base voltage of 120 v. With respect to rated primary voltage, the regulation range of 10% can be manually selected to be from 90 to 100%, from 95 to 105% or from 100 to 110%.

Voltage ratings of the first SRTs range from 2,400 to 14,400, inclusive. Kva ratings are 10 through 100. Operating features include a time delay that prevents hunting and unnecessary responses to momentary voltage fluctuations and temperature range of −40 C to +150 C. The self-regulating mechanism requires only 12 w for its operation.

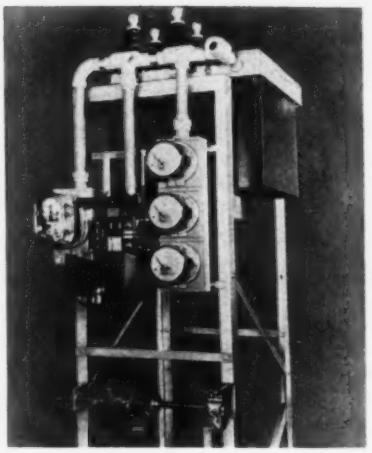
A. R. Waehner, L-M's director of transformer sales, announced that, although initially available in limited quantities, the first SRTs will be marketed on a nation-wide basis to permit field testing under a variety of conditions. Full-scale production is contemplated for early 1959.



### Metal-Clad Switchgear

(2) *Allis-Chalmers Mfg. Co., Milwaukee* 1, *Wis.*

A new line of indoor and outdoor 4.16-kv horizontal drawout metal-clad switchgear (type D) is available from this company. A feature is a new Ruptair power circuit breaker with improved interrupting characteristics to meet such needs as a two-cycle operation. Switchgear is 72 in. high, has eye-level instrumentation, and shoulder-height accessibility of auxiliary equipment. Aisle space required is 10 in. less than the company's vertical lift switchgear that is being replaced. Current transformers are mounted in a separately grounded metal barrier accessible from the breaker compartment. Insertion of the circuit breaker (see photo) requires less than 15 seconds from completely disconnected to fully connected position.



### Power Recloser

(3) *Westinghouse Electric Corp., Box* 2099, *Pittsburgh* 30, *Pa.*

A new 560-amp power recloser for small- and medium-size suburban substations having twice the interrupting capacity of the 400-amp power recloser is now available from this company. It has an interrupting capacity of 8,000 amp at 14.4 kv and 12,000 amp at 4.8 kv. The minimum interrupting time is 2½ to 3 cycles. The basic mounting dimensions, tank bushings, operating and relaying mechanism, and accessories are the same as the 400-PR. Either side of the 560-PR may be used for line or load.

### New-Type Conductor

(4) *Copperweld Steel Co.,* 322 *Frick Bldg., Pittsburgh* 19, *Pa.*

A completely new product for use in electrical transmission and distribution lines is announced by this company. Called "Alumoweld" wire, the aluminum-covered steel is expected to be used in overhead ground wires and ACSR transmission and distribution conductors. The company says that Alumoweld cores can be introduced into ACSR conductors without appreciably increasing the price. Advantages are: better corrosion resistance, better conductivity, lighter weight and high strength.

# 3-Way Lighting Merchandiser

Available NOW Thru Virden Distributors

**It's a smart attractive wall display** — Here, two 48 x 33" units make one 96 x 33" wall display. Accommodates up to 22 Virden wall fixtures. To extend it, just add more units.

**Add a ceiling now or later** — Here two 48 x 54" ceiling units are chain-suspended from the ceiling, will accommodate up to 26 Virden fixtures. Excellent for use in smaller rooms or where floor space is limited.

**Add legs — and you have a free-standing display!** Now it's a complete lighting center! Displays up to 48 Virden fixtures. Makes selection (and buying) easier, faster.

Packed complete! Shipped to you prepaid!

It's a brand new concept in lighting fixture display! Modular units, designed by Virden, to answer almost every conceivable display problem, to fit any shape room. You can use it singly, or multiples, around corners, in squares, oblongs, literally dozens of combinations. You can suspend it from the ceiling, hang it from the wall, or use it with legs for a free-standing unit.

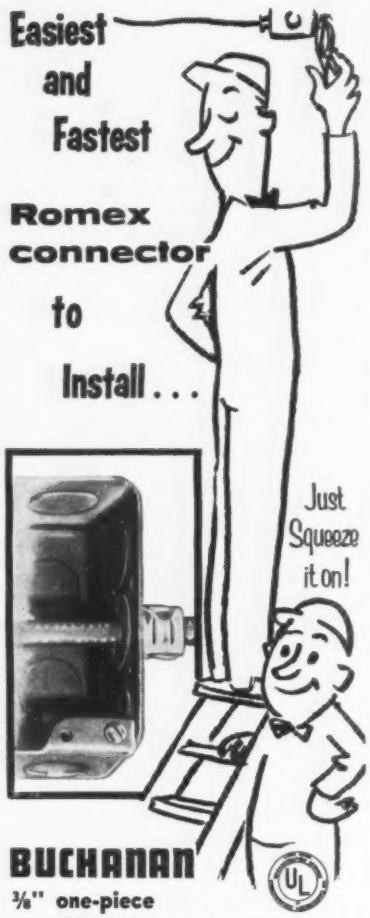
Smart in appearance, ruggedly made, it displays Virden fixtures perfectly, makes selling easier, faster, more profitable. Each unit is prewired with Bulldog Electrostrip. Metal panels in pastel colors are adjustable, slip out for easy fixture installation.

A colorful brochure, picturing and explaining this new merchandiser in detail, is available. See your Virden distributor or write John C. Virden Company, Marketing Division, Dept. EW, 5209 Euclid Avenue, Cleveland 3, Ohio.

VIRDEN Lighting

**virden**

Member American Home Lighting Institute

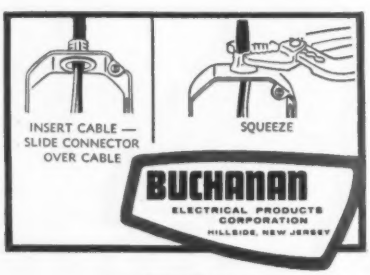



**⅜" one-piece pres-SURE Romex connector has no screws — and no lock nut**

To install merely insert cable in box knock-out, slide connector over cable and squeeze with channel lock pliers or side cutters—this simultaneously locks connector to cable and to box. (To remove, just squeeze opposite sides of connector.) Approved for 14/2, 14/3, 12/2, 12/3 and 10/2 non-metallic sheathed cable.

**Ask your wholesaler or write for Bulletin W-7**

U.S. PAT. NO. 2527227




Represented by
KENNETH ANDERSON CO.
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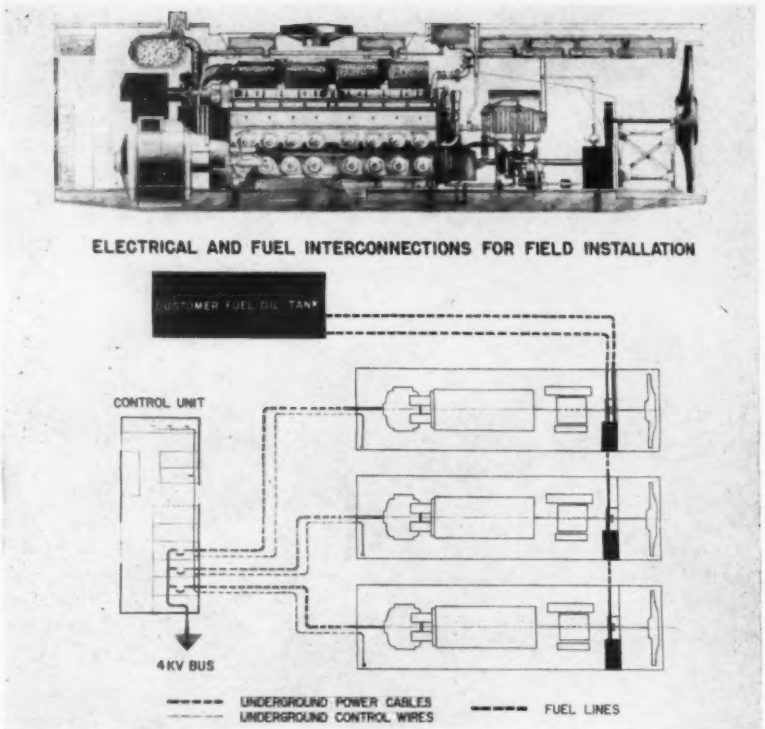



## Diesel Peaking Plant

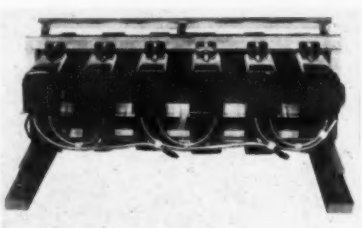
(5) *Electro-Motive Division, General Motors, La Grange, Ill.*

This company has designed a transportable diesel-power peaking and reserve plant of 6,000 kw capacity. It consists of three 2,000-kw generating units, each in its own steel, weatherproofed, sound-deadened housing, and one control unit with similar all-weather housing. Units are self-contained to the extent that the utility provides only a stone and railroad tie, or concrete base, and fuel tank. The manufacturer says the plant can be brought on-line with all three generators full load and synchronized within 90 seconds. Each generating unit weighs about 50 tons, and the control unit about 17 tons. Each can be shipped on a standard 40-ft flat car or low-boy trailer.

## Distribution Regulators

(6) *Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.*

By increasing the Vari-amp rating of their distribution regulators from 400 amp to 600 amp, this company has provided for extra kva capacity for their regulators. The rating of all distribution regulators of the company will be 160% of rated current with a maximum of 600 amp. For example, a 25-kva, 2,500-v regulator rated 100 amp is capable of carrying 160 amp at 5% regulation. A 100-kva, 2,500-v regulator rated 400 amp is capable of carrying 600 amp at 5% regulation.



## Underground Capacitors

(7) *General Electric Co., Schenectady 5, N. Y.*

A newly designed underground high voltage capacitor equipment is now available from this company's capacitor department. It is specifically designed for underground vaults and manhole installations subject to submersion. Features are corrosion-resistant 50-kvar capacitors with precision-welded, corrosion-resistant terminal boxes for cable connections. It finds application where there is an overhead system without pole space for capacitors or where an entire system is underground.

## Terminal Assembly

(8) *Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo.*

A new high-voltage bushing and terminal assembly is now being furnished by this company on its single- and three-phase distribution transformers 167 kva and below, 5,001 through 16,500 v. The phenolic insulating cover is threaded to fit over the end of the high-voltage terminal for bird and squirrel protection. The terminal is said to meet requirements of EEI-NEMA specifications for vertical take-off and conductor sizes. An accessory Bakelite tube is available for additional protection when bare conductor is used.

## Limit Switch

(9) *Square D Co., 4335 Valley Blvd., Los Angeles 32, Calif.*

This oiltight plug-in limit switch is said to provide wide flexibility and is designed for easy installation. The base receptacle can be mounted and wired without disassembly. The plug-in switch mechanism is reversible, and can be plugged in with the roller arm at either top or bottom. Used with a receptacle that can be mounted on its base or on either side, with conduit opening at top or bottom, six different mounting arrangements are possible. In addition, switch action can be reversed by simple screwdriver adjustment.

**Use coupon, p 22, to secure manufacturer's literature on these products.**

Build lines to STAY with the CHANCE 8-WAY!
Give the Guy a CHANCE
This gives you a mole's eye view of what goes on below "see" level when a Chance 8-Way Anchor is dropped into a hole the same size as the base plate and expanded into solid earth all around the hole.
Mike the Mole UNDERGROUND OBSERVER

**8-Way Expanding Anchors give you all 'round holding power**

Only the Chance 8-Way Expanding Anchor, with its 8 rib-reinforced blades, expands into solid earth *all the way around* to form a pyramid-like square.

This design adds strength to expanding anchors. The pyramid enlarges the effective area of the anchor's holding power. Blades that expand side by side leave no wasted space between them—can be shorter, less apt to bend, and expand in a wide area of solid earth all around the hole.

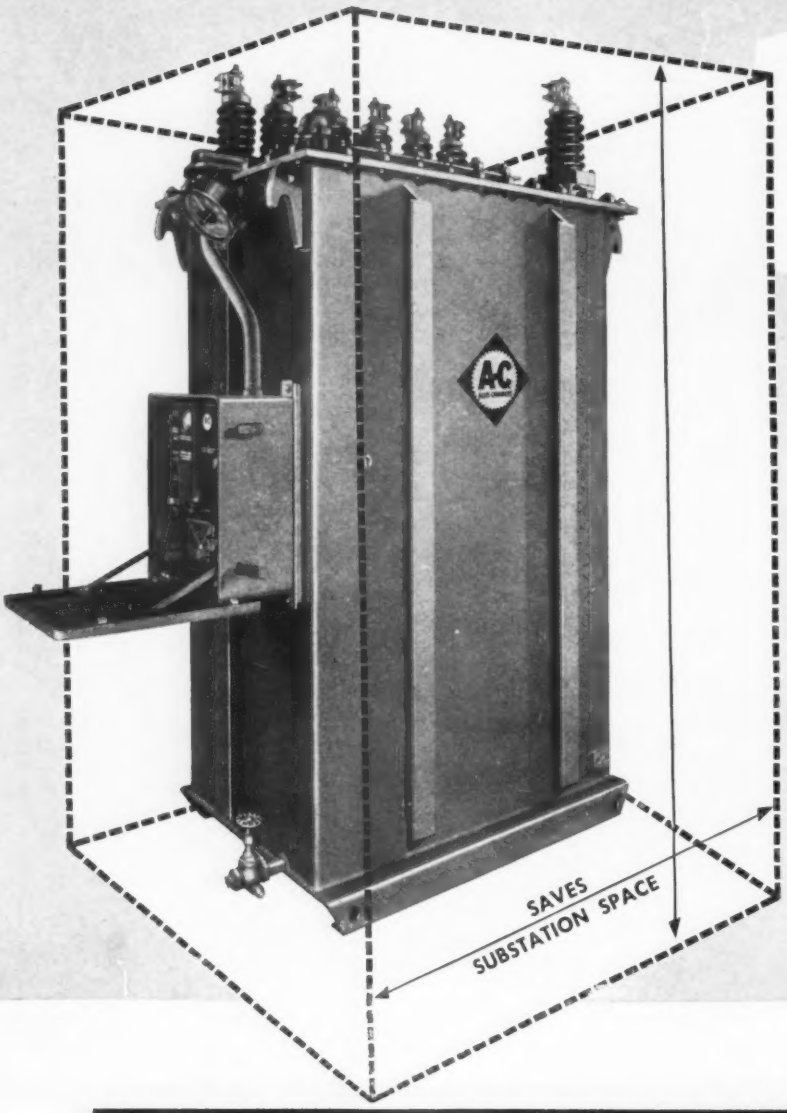
Make the Chance 8-way *your* standard for the kind of guying you can install and forget. Available from your anchor distributor, in sizes from 60 to 200 sq. in. in area.

*. . . and there are CHANCE ANCHORS for all other soil and guying conditions*

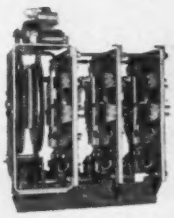
A·B·CHANCE CO. SAN FRANCISCO CALIFORNIA

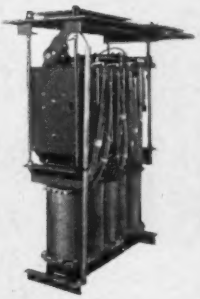
(A·B·CHANCE CO. of Canada, Ltd., Toronto) CA58-3

## Allis-Chalmers—25 years of leadership in 5/8% regulators




# NOW save 33% space... 30% cost





Illustrations show heavy-duty tap-changing mechanism and unit construction combined with new space-saving arrangement of tap-changing mechanism.

## NEW Allis-Chalmers 3-phase distribution regulators

Get these new benefits only with Allis-Chalmers new 3-phase distribution regulators:

- 33% less space required for distribution regulators in substation.
- 20% less weight for easier handling, lower installation costs than ever before.
- 30% less cost per kva of 3-phase regulation.
- 160% *Vari-Amp* rating is now provided to 600 ampere maximum.

Available in most popular ratings as follows: 500 and 750 kva, 8660 v; and 500, 750 and 1000 kva, 13,200 v.

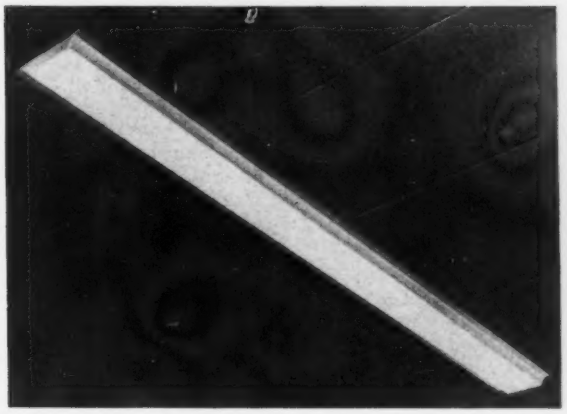
The important savings offered by these new units warrant re-evaluation of your present substation planning.

Check with your nearby A-C office or contact Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

*Originators of 5/8% Step Regulators*

# ALLIS-CHALMERS

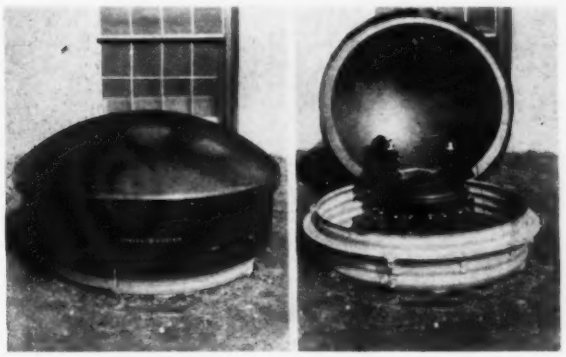
A-5768



## VHO Recessed Fixtures

(10) *Lighting Dynamics, 802 W. Whittier Blvd., Whittier, Calif.*

A new series of recessed troffer luminaires designed to use high output and VHO lamps is available from this company. Completely integrated with ceiling construction, the fixtures can provide 200 f-c lighting in large office areas, drafting or engineering rooms. The fixtures may be ordered in widths up to 12 in. and in units up to four slimline lamps. Standard lengths are 4, 6 and 8 ft with either a high-output 800-ma lamp, a VHO or PG 1,500-ma lamp, or two slimline lamps.



## Transformer Enclosure

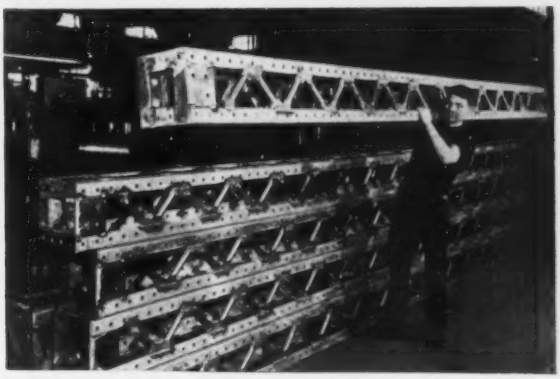
(11) *General Electric Co., Schenectady 5, N. Y.*

An enclosure for "burying" distribution transformers in residential neighborhoods has been introduced by this company. Designed for use in new housing developments where electric power lines go underground, the enclosures provide a safe, efficient place to put a standard pole-type transformer. Ratings up to and including 167 kva in the 15-kv class can be accommodated.

## Transmission Conductor

(12) *Southwire Co., Carrollton, Ga.*

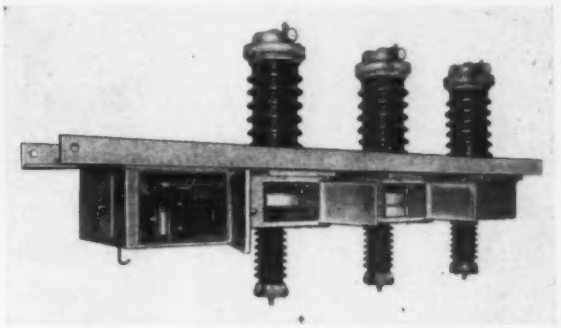
This manufacturer announces five important improvements in its aluminum transmission conductor. Minimum conductivity is increased to 62% IACS, tensile strength is higher, ductility is greater, it has smoother surface characteristics, and longer weld-free conductors. The company has changed over to entirely new melting and continuous casting equipment.



## Aluminum Substations

(13) *Handley-Brown Co., Jackson, Mich.*

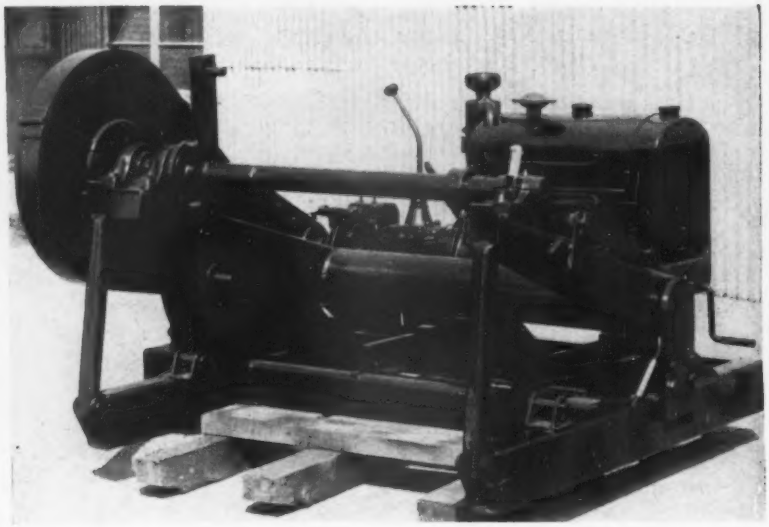
This new concept in aluminum substations is reported to achieve substantial savings in engineering, field assembly time and maintenance. The manufacturer reports that use of standard prefabricated aluminum components allows construction of a 46-kv substation in less than a day. Truss beams are 1-ft square or 1x 2½ ft, and are available in lengths up to 60 ft. They are of welded construction and consist of four extruded aluminum chords supported by lacing. Sides and ends are precision punched with holes spaced at 3-in. intervals. Trusses are bolted together to form columns and horizontal members.



## Circuit Breaker

(14) *Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.*

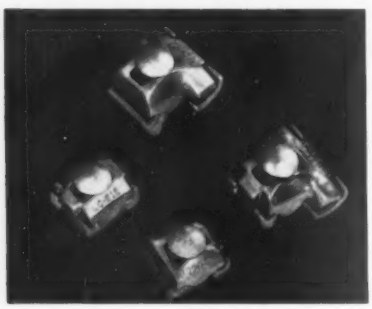
A new low capacity, sulphur hexafluoride gas filled circuit breaker with multiple reclosing abilities and designed for 46-kv systems is now available from this company. It has an interrupting rating of 250 mva and an interrupting time much better than its specified eight-cycle rating, according to the company. The new design is said to feature long mechanical and electrical life with minor and infrequent maintenance. The breaker is filled with gas at the low pressure of 60 psig. On opening, thermal expansion of the gas, at the pressure break, forces the flow of SF6 through the interrupting orifice as its moving contact is withdrawn, thereby performing the interrupting function.



## Cable Puller

(15) *Petersen Engineering Co., Inc., Santa Clara, Calif.*

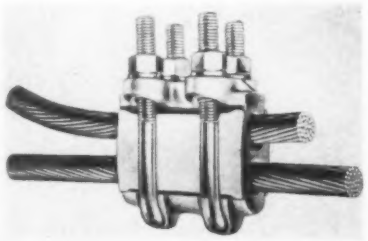
The Pengo 5400 cable puller, a self-powered unit designed for stringing or reconductoring light distribution circuits, is announced by this company. Capable of loading and unloading reels up to 34 in. wide by 48 in. in diameter, and weighing 5,000 lb, the new cable puller can be mounted on either a flat-bed truck or a trailer. The puller is rated to produce a maximum pull of 1,000 lb at speeds up to 3 mph, with a 15-bhp gasoline engine. Reels can be raised or lowered hydraulically in less than 60 seconds.



## Connectors

(16) *Anderson Electric Corp., Drawer 2151, Birmingham 1, Ala.*

Three new lines of one center bolt parallel groove connectors are announced by this company. Features are: a wrap-a-round top that can be worked hot by vise grip pliers, and a new top curvature that assures bolt forces on the centerline of the bolt. Interlocked fingers on both sides of all aluminum-to-aluminum connectors are said to insure better cable containment, and a new contact design gives greater contact pressure area. Available in 21 sizes, with liners or plating for bi-metallic connections and bare for aluminum-to-aluminum applications.



## Parallel Groove Clamp

(17) *Burndy Corp., Norwalk, Conn.*

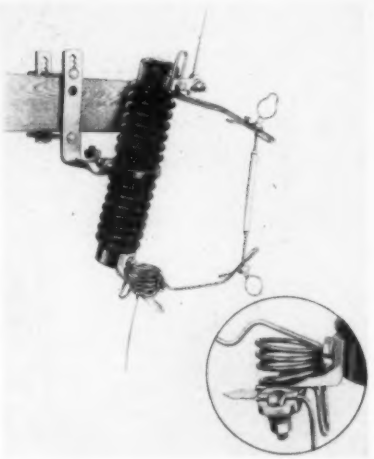
This new heavy-duty, all-aluminum parallel groove clamp is designed for use with aluminum, copper and ACSR. Only three connector sizes cover the range from 3/0 through 954 mcm. Special aluminum U-bolts and tapered bell mouths are said to minimize cold flow and eliminate cable chafing. A modified V-groove produces wiping action on the cable for good electrical performance over the full range of the connector.

**For additional information, fill in coupon on p 22.**

## Vacuum Tube Interrupter

(18) *Delta-Star Electric Division, H. K. Porter Co. Inc., 2437 Fulton St., Chicago 12, Ill.*

This company is now producing a three-pole vacuum tube interrupter on MK-40 disconnects with resistors mounted alongside the vacuum tubes. The interrupter units consist of five smaller tubes inside one large Pyrex tube per phase. The MKV-40 switch is rated 46-kv nominal, 600 amp with 20,000-amp momentary capacity. Resistors in the unit limit in-rush current to 700 amp. Application is for interruption of load and charging currents, and the switching of large banks of capacitors.



## Cutout

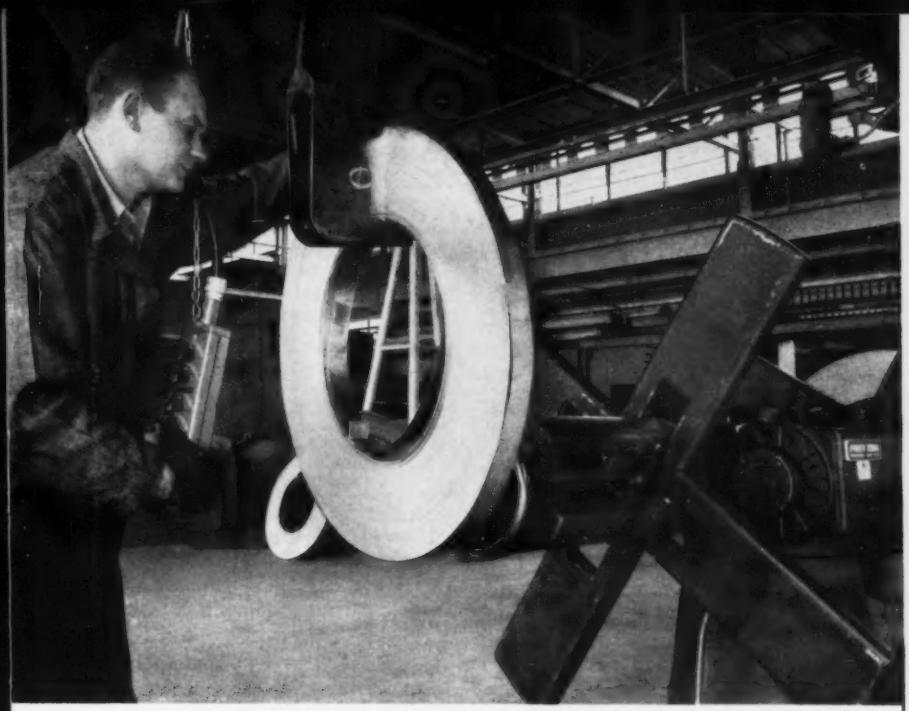
(19) *A. B. Chance Co., Centralia, Mo.*

Two new design features have been added to this company's Protecto-Link cutout. It now has wide-range cadmium-coated terminals and bird-proof construction. Upper and lower terminals of the cutout accommodate No. 6 solid copper to 3/0 ACSR, or 4/0 seven-strand copper. Made in 7.5- and 15-kv, 50-amp models.

## Circular Slide Rule

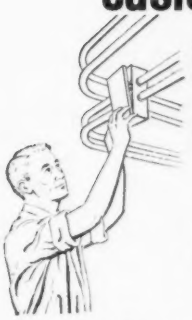
(20) *General Industrial Co., 5738 N. Elston Ave., Chicago 30, Ill.*

This company has introduced a handy circular slide rule for engineers or plant and office executives. It serves as a pocket-size calculator for multiplication, division and to find proportions.



Here operator loads pay-off arm with a fresh coil of selected, precisely slit steel.

# easier-working CIRTUBE* EMT begins right here with the finest steel!



All the care in the world can't make the kind of EMT contractors like working with — unless the steel's right in the first place.

New CIRTUBE EMT is made with the right kind of steel: specially selected, cold rolled, uniform in quality — and with just the right amount of carbon content for ideal working qualities.

But the right steel isn't enough — proper processing is needed, too. Circle's modern processes are designed to keep in the natural bendability of the high grade steels it selects to make CIRTUBE EMT. Result: tubing that can take it with just the right amount of workability.

Proper steel is only one of many reasons why new CIRTUBE EMT helps get faster, better looking wiring jobs.

Next time you order, try new CIRTUBE EMT — you'll like working with it. Now at your Circle wholesaler's.

*Trade Mark

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*a subsidiary of*
CERRO DE PASCO CORPORATION

**PLANTS:** Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** In all principal cities

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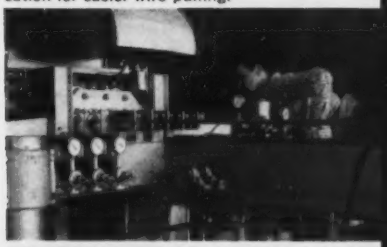
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

CIRTUBE EMT *Ask for it!*

***Split-free, bead-free!*** Induction welded CIRTUBE EMT, left, proves stronger than ordinary EMT, provides easier fishing.

***Easy fishing!*** A baked-on protective coating gives CIRTUBE EMT a built in lubrication for easier wire pulling.



***Lifetime exterior finish!*** Hard galvanized finish for durability; polished satin lustre for lasting good looks.

***Automated quality control!*** Automatic controls assure complete and continuing uniform quality of product.

***Tight, easily handled bundles!*** Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

***Fast, friendly service!*** Well-known Circle service through a nation-wide network of well stocked nearby warehouses.

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For dependable performance . . . insist upon Crapo Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes Crapo Steel Strand first choice for guys, messenger and overhead ground wire.
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• Low maintenance cost
• Laboratory tested and controlled quality
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• A size and grade for all practical needs
• Contact your Crapo Jobber Today!
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STEEL & WIRE CO., INC.
Muncie, Indiana


# BULLETINS ETC.

(21) **TRUCK INFORMATION**—The new 1958 edition of "Truck and Trailer Size and Weight Restrictions," a pocket-size booklet compiling the laws of all 48 states and the District of Columbia regulating size and weight of trucks and trailers, has been prepared by Four Wheel Drive Auto Co., Clintonville, Wis. Send your request to the Public Relations Department.

(22) **DISTRIBUTION CUTOUTS**—Two new pieces of basic information literature on distribution cutouts have just been published by S&C Electric Co., 4435 Ravenswood Ave., Chicago 40, Ill. Information on open cutouts is in bulletin 511, and in bulletin 512 is information on open link cutouts.

(23) **WIRING DEVICES**—Perfect-Line Mfg. Corp., Old Country Rd. & Railroad Ave., Hicksville, Long Island, N. Y., has published a 26-page catalog covering its entire line of engineered wiring devices and electrical hardware.

(24) **SILICONE CABLES**—National Electric Products Corp., Gateway Center, Pittsburgh, Pa., is offering a new booklet on silicone rubber insulated cables. Information is selected to help electrical engineers prepare specifications.

(25) **CONDUCTOR**—Complete commercial availabilities of the new all-aluminum alloy conductor for distribution systems are listed in a booklet just published by Kaiser Aluminum & Chemical Sales Inc., Dept. NR-12, 919 N. Michigan Ave., Chicago 11, Ill. The advantages of the new conductor are also included.

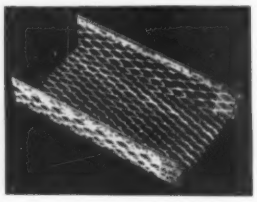
(26) **DISTRIBUTION TRANSFORMERS**—Features of General Electric's pole-type distribution transformers are described in bulletin GEA-6070C. The booklet reviews the design and construction of the company's transformers. Address your request to Schenectady 5, N. Y.

(27) **STEAM TURBINES**—Design and construction features of Allis-Chalmers WA-Series steam turbine-generating units rated 2,000 through 16,500 kw are covered in a new 40-page bulletin released by the company. Ask for 03B7654A. Address your request to Industries Group, Milwaukee 1, Wis.

(28) **MOTOR PROTECTION**—Fundamentals of selective short-circuit protection for motor circuits are covered in a new bulletin by I-T-E Circuit Breaker Co., Small Air Circuit Breaker Division, Philadelphia 30, Pa. Ask for bulletin No. 5040-A. Features and applications of the type ETI molded-case circuit breaker are described.

(29) **CATALOG**—A new catalog presented in a pictorial index manner is being distributed by Nelson Electric Mfg. Co., Tulsa, Okla. It presents an over-all picture of the company, its facilities and principal items of electrical equipment. Low-voltage switchgear, explosionproof equipment, high-voltage motor starters and various other products are itemized.


**COPE CABLE TROUGH READY FOR CABLE IN MINUTES**



Available in galvanized steel and aluminum. Also in mesh or solid construction. Furnished in a variety of widths from 6" to 24" and in 8', 10' and 12' lengths. COPE Cable Trough is installed quickly with patented COPE pin-type coupler. Recommended for non-metallic sheathed power cables.

COPE Cable Ladder and Cable Channel and system Supports are also available.

*For further information contact*

**GEO. E. HONN CO.**

420 Market Street San Francisco, Cal.
Phone SUtter 1-7352


**KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.**

**ELECTRICAL WEST** *Not good*
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Please send me, without obligation, the new product information or catalogs:

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High costs
got you in a stew?

**See how you can save on electrical equipment maintenance with**

# Shell Diala Oil AX

*the modern insulating oil*

**Switch to Shell Diala Oil AX** and three things happen to improve your cost picture.

**First**—and case histories prove this—you get far longer service life from your electrical equipment.

**Second**—you extend the interval between costly maintenance checks.

**Third**—you use less oil.

Savings like this are possible because Shell Diala AX's unique qualities make it far more effective, *far longer*, than ordinary insulating oils. The secret is a Shell-developed oxidation-inhibiting agent incorporated in an oil specifically refined for inhibiting. So effective is this combination, accelerated tests in Shell research laboratories show Diala AX undergoes no appreciable deterioration in a period equal to 50 years of normal use. Years after ordinary oils fail, this insulating oil is still acid and sludge-free.

Put Shell Diala Oil AX to work protecting your electrical equipment. Call your Shell representative.

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**SHELL DIALA OIL AX**

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- ✓ **high flash and fire points**
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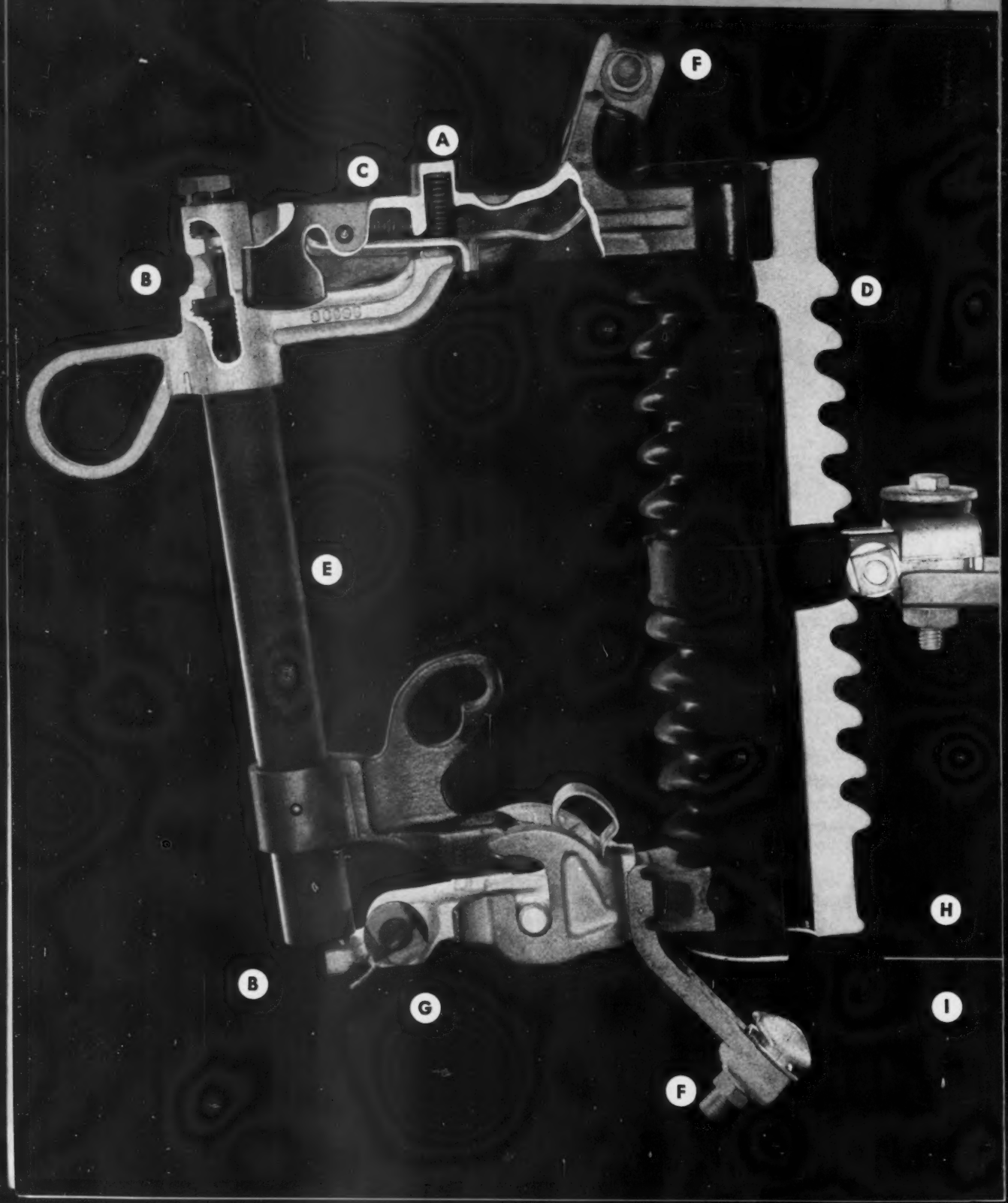
- ✓ **high dielectic strength**
- ✓ **excellent demulsibility**

# For full range fault protection...



# specify KEARNEY Type "G" Cutouts

Extensive, rugged, field operating tests prove that the Kearney Type "G" Cutout provides full protection throughout the complete range of fault currents—without use of adaptors or gadgets.

Study the advanced features that make these extra heavy duty cutouts your most logical choice for line fusing, transformer and capacitor protection.

Ask your Kearney representative to explain fully why you can count on Kearney Type "G" Cutouts for superior construction, thorough dependability and unfailing protection.

## Check These Advanced Features

- **A** Full Floating Contact—stainless steel spring absorbs upward thrust, maintains contact pressure until arc is extinguished.
- **B** Gas Vents—double vent action minimizes internal gas pressure.
- **C** Horizontal Stainless Steel Spring—helps absorb recoil during fault interruption, takes shock when closing cartridge.
- **D** Insulator—designed for strength and lightness, barrier prevents internal leakage.
- **E** Cartridge—½" bore assures positive interruption of low faults; extra strength tube withstands pressure of high currents; accepts universal fuse links; no need for adaptors and other gadgets.
- **F** Terminals, Plated T-Lug Design—for use with all types of conductors.
- **G** Flipper—whip action provides 4" travel in separating blown fuse link.
- **H** All live parts non-ferrous or stainless steel.
- **I** Can be field or factory equipped with link break attachment.

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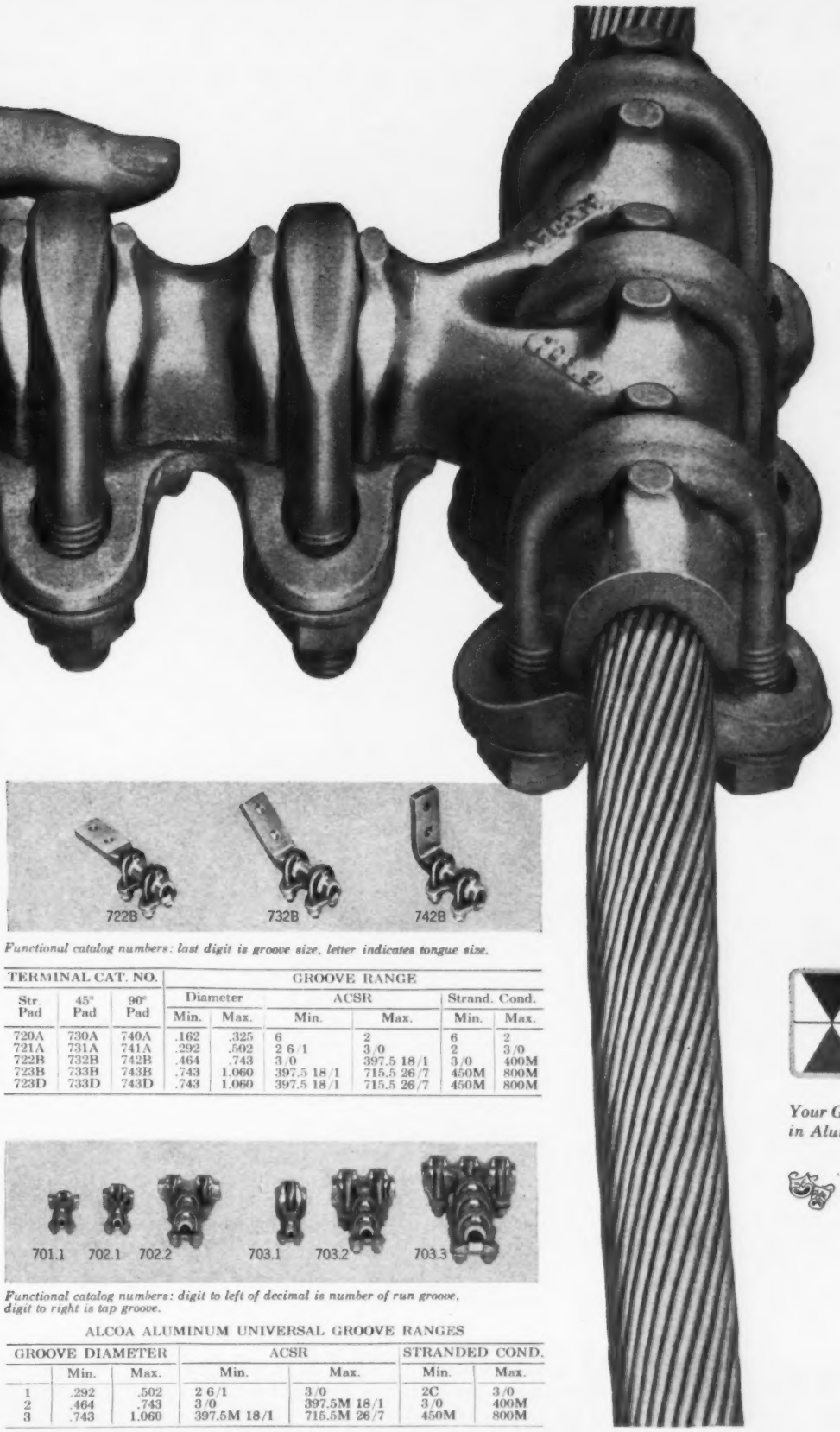
# NEW! Terminal and Tee Connectors with ALCOA UNIVERSAL GROOVES

This new series of bolted terminal and tee connectors has been designed with Alcoa's heavy-duty universal groove. This is the same groove that is used in Alcoa's new series of clamps now winning praise from utility men.

It takes only three groove sizes to accommodate the full range of ACSR from #2 to 715.5 MCM and #2 to 800 MCM stranded aluminum. This feature introduces easier ordering, simplified stocking and low inventories. Because we stock these items, you can also expect fast delivery. And, best of all, you get all these benefits at low cost.

With all these extras, you still get top Alcoa quality. Dependability and service have been proved by months of extensive laboratory testing. The bolts are anodized and lubricated to reduce thread friction, and all parts are aluminum to equalize expansion, eliminate corrosion. The grooves are specially treated and coated to provide low contact resistance. Copper bushings are available if desired.

Call Alcoa to see samples of the new terminal and tee connectors. Or write for more information—ALUMINUM COMPANY OF AMERICA, 2308-G Alcoa Building, Pittsburgh 19, Pennsylvania.






*Functional catalog numbers: last digit is groove size, letter indicates tongue size.*

| TERMINAL CAT. NO. | | | GROOVE RANGE | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Diameter | | ACSR | | Strand. Cond. | |
| Str. Pad | 45° Pad | 90° Pad | Min. | Max. | Min. | Max. | Min. | Max. |
| 720A | 730A | 740A | .162 | .325 | 6 | 2 | 6 | 2 |
| 721A | 731A | 741A | .292 | .502 | 2 6/1 | 3/0 | 2 | 3/0 |
| 722B | 732B | 742B | .464 | .743 | 3/0 | 397.5 18/1 | 3/0 | 400M |
| 723B | 733B | 743B | .743 | 1.060 | 397.5 18/1 | 715.5 26/7 | 450M | 800M |
| 723D | 733D | 743D | .743 | 1.060 | 397.5 18/1 | 715.5 26/7 | 450M | 800M |




*Functional catalog numbers: digit to left of decimal is number of run groove, digit to right is tap groove.*

ALCOA ALUMINUM UNIVERSAL GROOVE RANGES

| GROOVE DIAMETER | | | ACSR | | STRANDED COND. | |
|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. |
| 1 | .292 | .502 | 2 6/1 | 3/0 | 2C | 3/0 |
| 2 | .464 | .743 | 3/0 | 397.5M 18/1 | 3/0 | 400M |
| 3 | .743 | 1.060 | 397.5M 18/1 | 715.5M 26/7 | 450M | 800M |

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ELECTRICAL CONDUCTORS AND ACCESSORIES

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# THE PEACEFUL ATOM

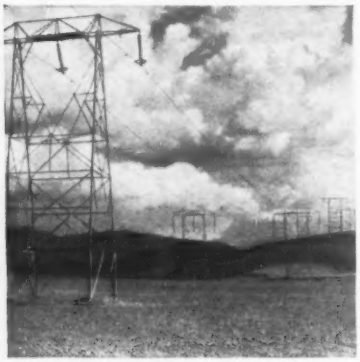
## ...a sound investment for increasing power requirements

### 15 Utility Companies Underwrite Study For Advanced Nuclear Power Reactor For the Southwest

Up from the Texas Panhandle... through the oil fields of Oklahoma... across the Kansas prairie... over the Ozarks of Arkansas and Missouri... and down through the rich bottom land of Mississippi and Louisiana stretches a vast network of electric power lines and generating stations. Through this vital system surges millions of kilowatts of power... lifeblood of the Southwest's cities, farms and factories.

The bulk of this power (6,250,000 kw) is generated by fifteen investor-owned utility companies. Recently these firms made a decision that brings peaceful atomic energy into an important new phase.

**Planning together** as the Southwest Atomic Energy Associates, they signed a multi-million dollar contract with Atomics International to develop an advanced reactor concept for full-scale atomic-electric power stations. The new project is called AETR (for Advanced Epithermal Thorium Reactor). It promises to be economically competitive with power plants that depend on diminishing, increasingly expensive conventional fuels. Studies will be directed toward the design of a nuclear power plant of 200,000 electrical kilowatts.



NEW POWER FOR THE SOUTHWEST
Fifteen companies pool resources to develop an advanced power reactor

Interest in the project is indicated by a roster of the new group's member companies: Arkansas Power and Light Co., Arkansas-Missouri Power Co., Central Louisiana Electric Co., Inc., Empire District Electric Co. (Mo.), Gulf States Utilities Co., Kansas Gas and Electric Co., Kansas Power and Light Co., Louisiana Power and Light Co., Mississippi Power and Light Co., Missouri Public Service Co., New Orleans Public Service, Inc., Oklahoma Gas and Electric Co., Public Service Co. of Oklahoma, Southwestern Gas and Electric Co. (La.), and Western Light and Telephone Co., Inc. (Mo.).

SEVEN STATES MAP OUT A PLAN FOR ATOMIC ELECTRICITY

**Hardware in Action.** AI has built and is now operating two other nuclear power reactors as part of the AEC's program for economical power from atomic energy. One of these is the Sodium Reactor Experiment (SRE) which is supplying nuclear heat to operate an experimental electric power plant installed by the Southern California Edison Co. The SRE is providing technical data and experience for the design of full scale electric stations, such as the 75,000 kw plant for Consumers Public Power District of Nebraska.

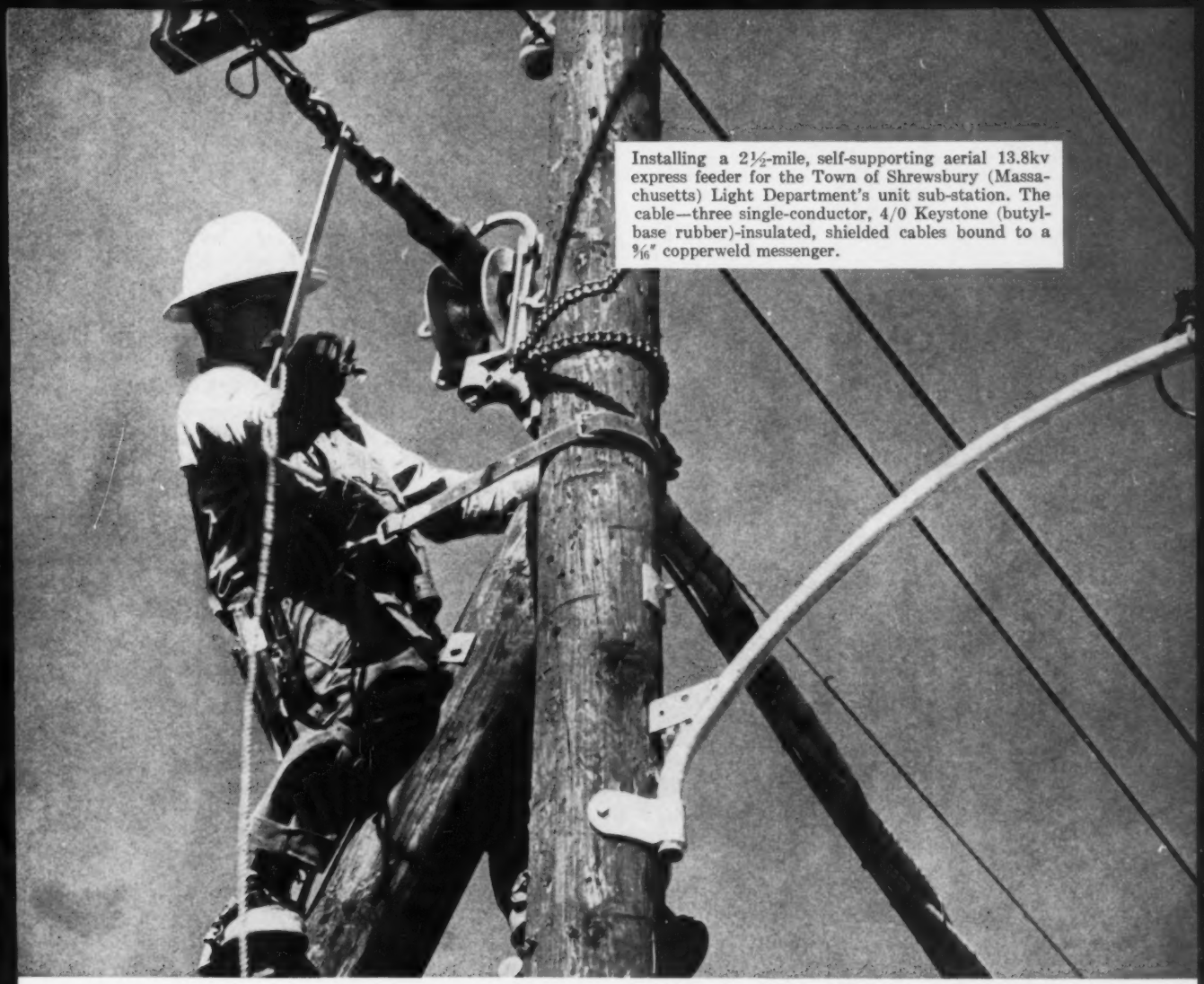
AI's Organic Moderated Reactor Experiment (OMRE) has been operating at the AEC's National Reactor Testing Station in Idaho Falls since last September. It has provided technical and economic information for the construction of OMR power plants now planned for the City of Piqua, Ohio, and large network installations under consideration for this country and abroad. Atomic propulsion systems for supertankers and merchant ships are another important OMR application.

In addition, Atomics International research reactors are helping to bring "Atoms for Peace" to the free world. These reactors are now operating in Japan, Germany, Denmark, and the United States. Another is under construction for Italy.

**Nuclear Power Abroad.** AI works with leading companies overseas. With DEMAG, one of West Germany's largest heavy manufacturers, AI has formed INTERATOM, a jointly owned subsidiary headquartered in Duisburg. AI has a technical assistance agreement with ASEA, a prominent Swedish electrical firm with offices in over 50 countries.

ATOMICS INTERNATIONAL, P.O. Box 309, Canoga Park, Calif. Cable Address: ATOMICS.

**ATOMICS INTERNATIONAL**
A DIVISION OF NORTH AMERICAN AVIATION, INC.
*PIONEERS IN THE CREATIVE USE OF THE ATOM*



Installing a 2½-mile, self-supporting aerial 13.8kv express feeder for the Town of Shrewsbury (Massachusetts) Light Department's unit sub-station. The cable—three single-conductor, 4/0 Keystone (butyl-base rubber)-insulated, shielded cables bound to a 9/16" copperweld messenger.

Contractor: The Theodore D. Bross Line Construction Company

# Modernize with Okonite self-supporting aerial cable...

The Town of Shrewsbury Light Department did just this when they recently installed a 13.8kv express feeder. They chose an Okonite self-supporting aerial cable because they wanted a superior installation that would practically eliminate tree trimming costs . . . be more reliable in storms (operate even with poles down) . . . reduce pole congestion . . . assure fewer interruptions or outages . . . have a moderate cost . . . provide improved voltage regulation because of lower reactance . . . and be more economical to operate and maintain than equivalent open wire lines.

In choosing Keystone (butyl-base rubber)-insulated cables for this important feeder, Shrewsbury Light Department was also banking on high voltage cable with a record for long and dependable service . . . high resistance to ozone and corona cutting . . . ability to take sharp bends . . . stable operation at copper conductor temperatures as high as 85C at 15kv . . . excellent resistance to moisture and extremes of temperatures.

For the complete story on Keystone-insulated cables, contact your Okonite representative . . . or write for Bulletin WE-463 where the results of field service and tests are reported with graphs and charts together with 36 pages of technical data.

The Okonite Company, Passaic, New Jersey.

*where there's electrical power . . . there's* **OKONITE CABLE**

4912

# Panelboard planning helps

The special requirements inherent in modern hospital function make design and selection of the proper components to POWER-UP the electrical system far more exacting than for many other applications.

One example of careful electrical planning is the United States Naval Hospital addition at San

# Power-up San Diego Naval Hospital

Diego, California, where Westinghouse Panelboards were specified to serve as the vital nerve centers of the hospital electrical distribution system.

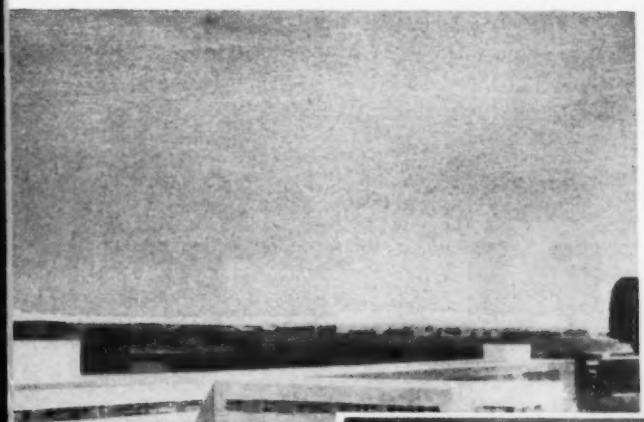
In addition to several Westinghouse switchboards, a total of seven Westinghouse type CDP power distribution panelboards and 64 type NA1B lighting panelboards were installed in the new 1000-bed addition to the naval hospital.

Find out how Westinghouse Panelboards can help you POWER-UP for greater profits; contact your nearby Westinghouse office, or write: Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania. J-93544

United States Naval Hospital, San Diego, California

ARCHITECT-ENGINEERS: Welton Becket and Associates, Los Angeles, California

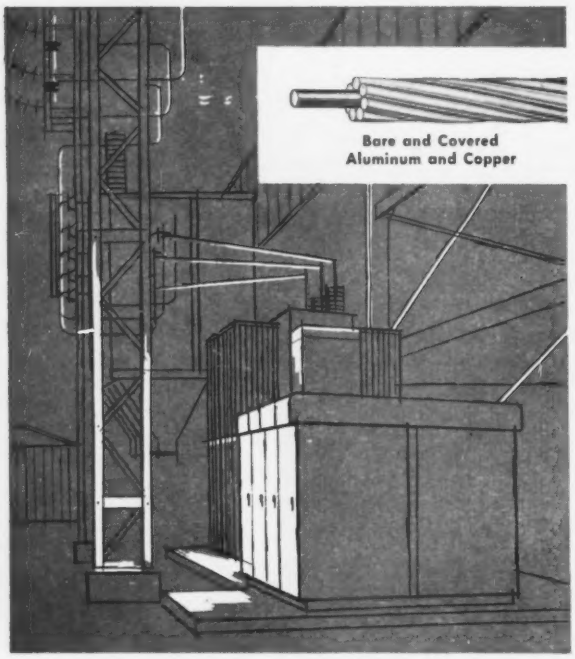
GENERAL CONTRACTOR: George A. Fuller, Dallas, Texas



Hospital electrician examines Westinghouse NA1B Panelboard on corridor wall. Each of these 64 panelboards controls 40 different hospital lighting circuits.

Architect-Engineers: Welton Becket and Associates

YOU CAN BE SURE...IF IT'S Westinghouse

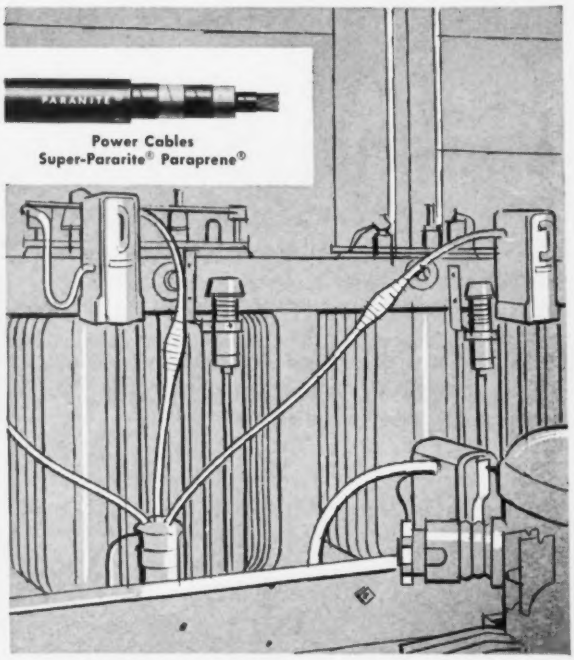




Bare and Covered
Aluminum and Copper




Power Cables
Super-Pararite® Paraprene®



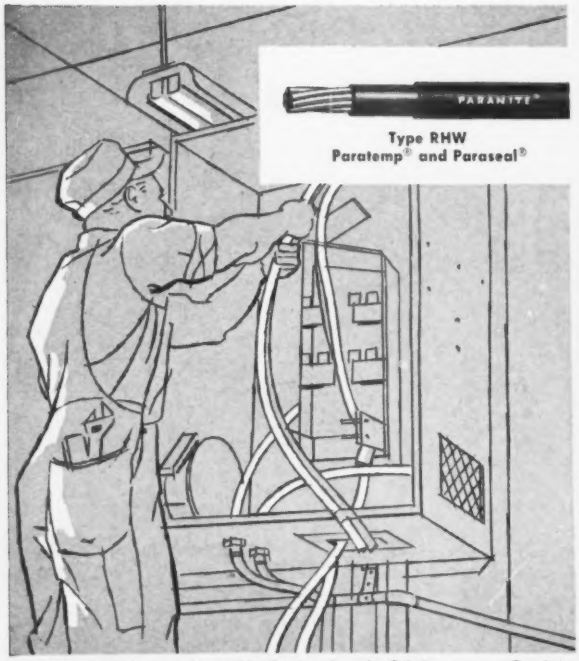
# From Source to Service with PARANITE®

**PARANITE WIRE AND CABLE DIVISION**

*Essex Wire Corporation*

FORT WAYNE 6, INDIANA

*MANUFACTURING PLANTS:* Birmingham, Alabama; Anaheim, California; Jonesboro, Indiana; Marion, Indiana; Tiffin, Ohio

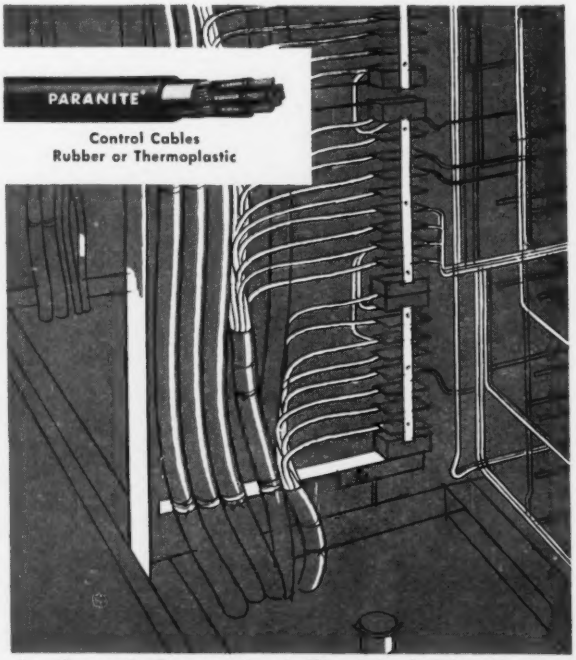





Type RHW
Paratemp® and Paraseal®




Control Cables
Rubber or Thermoplastic



*Sales Offices in all Principal Cities . . . Sold only through Recognized Electrical Distributors*

TEAR OUT ALONG THIS LINE AND FILE THIS FOLDER FOR REFERENCE

SRT Transformer

From the
research and development
laboratories of Line Material

# A Revolutionary New Engineering Development

By **RODGERS G. WHEATON**
President
Line Material Industries

For over ten years, Line Material engineers have been working toward the development of a self-regulating distribution transformer. They have recognized that to apply voltage regulation to a line is most desirable; but that the place where load variations start is with the individual power user or small group of users.

**Regulation—At the Load**

Therefore, if the electrical industry can supply an unvarying voltage in the face of widely varying demands of the individual home or building, we will to a large extent solve one of the major operating problems of the industry.

The requirements were rigid. But the engineers have succeeded. Today Line Material announces the first Self-Regulating distribution Transformer —which we call the SRT.

**Production To Be Increased**

For the time being, the available number of SRT's is limited. We will increase production as rapidly as possible. Those now available will be sold to utility companies who are willing, for the benefit of the industry, to cooperate on a test program.

We are asking the companies who buy these SRT's to test them in various types of service where their operation and economies can be recorded.

**Let Us Send You Information**

If now, or in the future, you may be interested in cooperating in this test program, let us send you technical information that will better enable you to analyze your own opportunities for taking advantage of this outstanding new type of transformer. Phone, wire, or write: Line Material Industries, Milwaukee 1, Wisconsin.

# SRT

LM

## LINE MATERIAL Industries

McGRAW-EDISON COMPANY

Distribution Transformers

McGRAW EDISON

# Here it is!

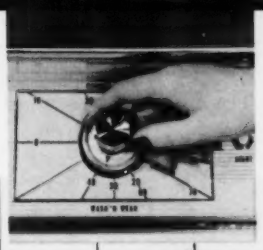
*the world's first*

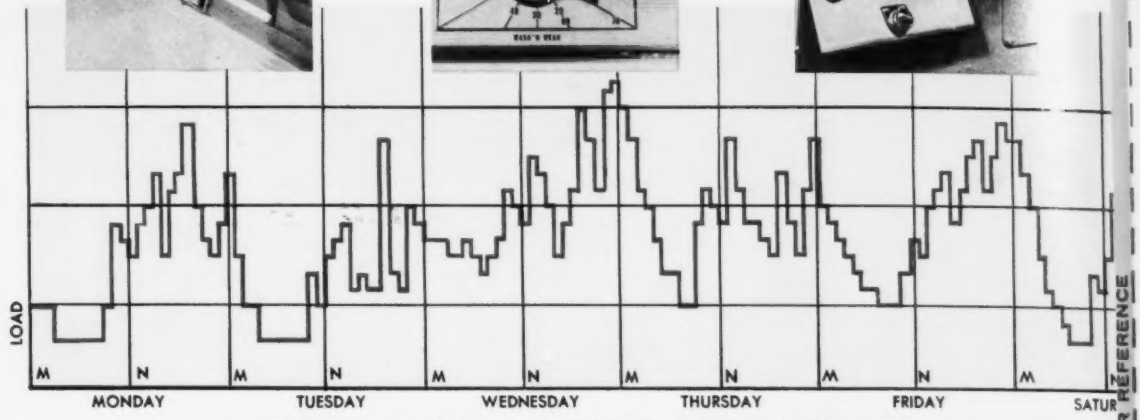
# Self-Regulating distribution Transformer

SRT Transformer

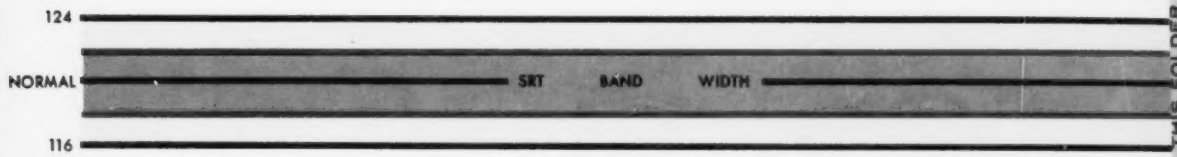
TEAR OUT ALONG THIS LINE AND FILE THIS FOLDER FOR REFERENCE

LINE MATERIAL INDUSTRIES • MILWAUKEE 1, WISCONSIN






**Actual utility company load curve on a transformer for an August week (blue line).**




**With SRT, voltage would have been maintained within the band width (red line) under the above load conditions.**

# HOW THE SELF-REGULATING TRANSFORMER WORKS

By **RICHARD C. KIRK**
Manager of Engineering, Kyle Products
Line Material Industries

The new L-M Self-Regulating Transformer consists of a Round-Wound® distribution transformer with extra taps on the *primary*, and a regulating mechanism that is volt-sensitive on the *secondary*. The device switches primary taps to change the transformation ratio as needed.

### Meets Rigid Requirements

We have worked over ten years to perfect this system. It fully meets our rigid requirements—compactness, extreme reliability, and long life. One 2400 volt tap changer has now operated more than 250,000 times—equivalent to over 40 years' life on a 25 kva transformer.

### "Adapt-a-Tap" Range Selector

A unique feature of SRT is the "Adapt-a-Tap" range selector. It provides a full 20% range within which the taps for the 10% automatic regulation, in four 2½% steps, may be selected, all below, straddle, or all above normal. Thus, SRT can be located *anywhere* on the line, at the end, the middle, or near the substation.

### Nominal 3½-Volt Band Width

The midpoint is set at 120 volts. SRT operates whenever the voltage drops to 118¼ or rises to 121¾. Each operation occurs only after a time delay. This prevents undesirable operation or "hunting" on switching surges and momentary voltage variations outside the band width.

### An Outstanding Contribution

We believe the application of voltage regulation to the individual customer to be of extreme value to the utility industry, and we are confident that the design of the SRT will fully meet the requirements set for it.

By **ROBERT P. THOMPSON**
Manager of Engineering, Transformers
Line Material Industries

The SRT is a significant departure in the field of voltage regulation, because it corrects the voltage *at the point of use*. The SRT corrects overvoltage; it compensates for line drops and load increases.

### Prevents Undervoltage

For example, if two or three customers turn on their ranges at the same time, causing a voltage drop, the SRT will, after a time delay, change taps and return the voltage to the desired level. If additional loads drop the voltage again, the SRT again brings it back up.

### Prevents Overvoltage

Near the substation, where the primary voltage may be too high, the SRT prevents overvoltage from reaching the user. This greatly reduces burnouts of TV tubes, and of incandescent lamps—the latter a very obvious saving to a company with a lamp replacement program.

### Increases Income For The Utility

It is a known fact that low voltage causes loss of revenue. By maintaining proper voltage, the SRT prevents the drop in billings caused by undervoltage, which in the aggregate can represent a considerable loss to the utility company.

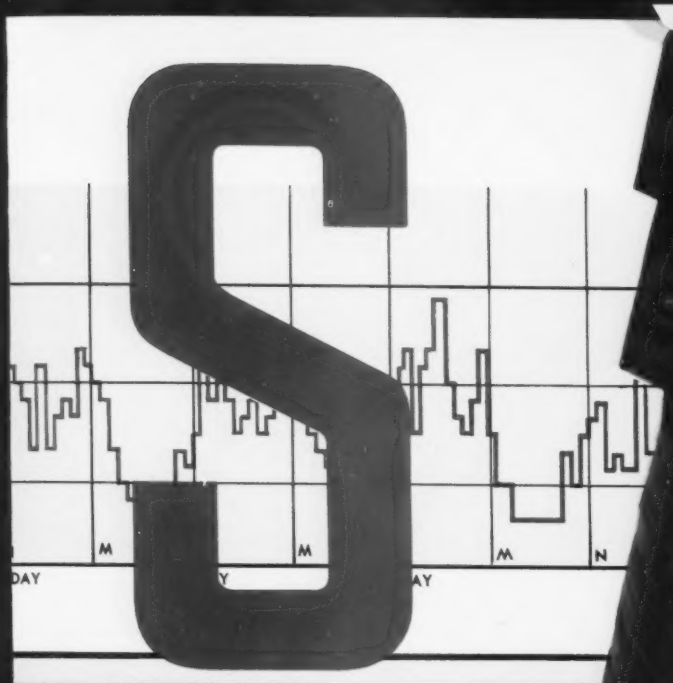
### Improves Customer Relations

With correct voltage, lights are brighter; television sets, clothes dryers, air conditioners, and other appliances operate at maximum efficiency; ranges heat faster.

Thus the SRT offers the utility savings, in several ways, and many opportunities for improved customer relations

TEAR OUT ALONG THIS LINE AND FILE THIS FOLDER FOR REFERENCE

SRT Transformer



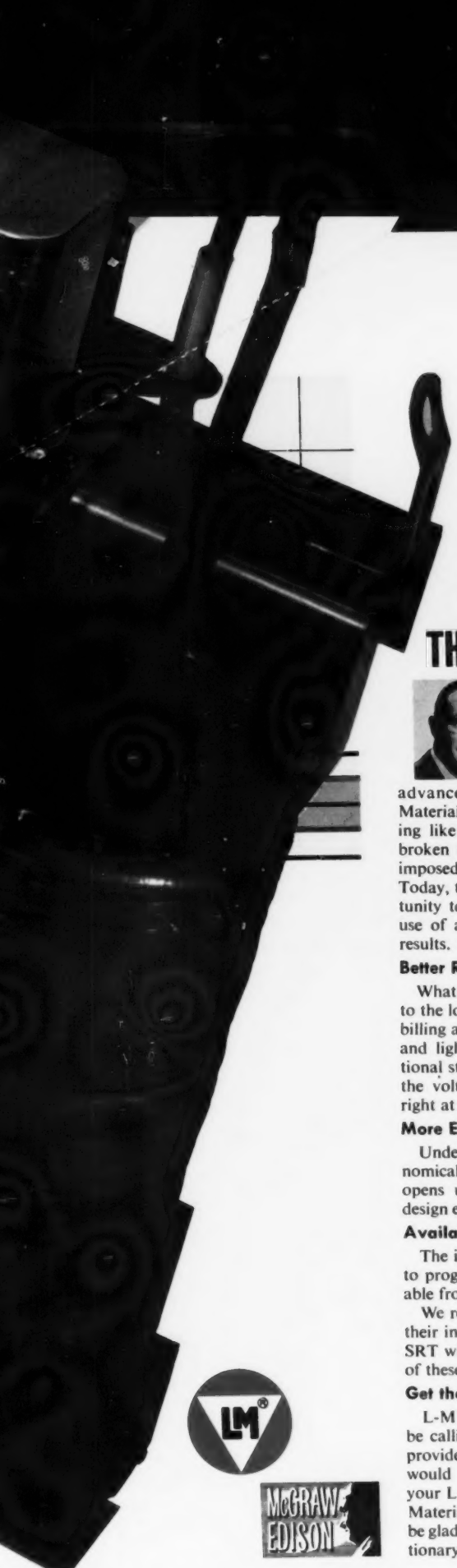
# SRT

SRT—The Self-Regulating distribution Transformer—consists of an L-M Round-Wound assembly with special taps and an under-load tap changer (below) and the exclusive L-M regulating mechanism (above). SRT's will be available in the following ratings:

2400 volts, 10 through 25 kva
4160 volts, 10 through 37½ kva
4800 volts, 10 through 50 kva
7200 and 7620 volts, 10 through 75 kva
12,000 and 14,400 volts, 10 through 100 kva

**LINE MATERIAL Industries**

McGRAW-EDISON COMPANY



# WHAT THE NEW SRT WILL DO FOR THE UTILITY COMPANY

By **A. R. WAEHNER**
Director, Transformer Sales
Line Material Industries

We believe the SRT is the greatest advance in distribution transformers since Line Material introduced the Round-Wound® design. Nothing like it has ever been available. We feel we have broken through a barrier of tradition and limitations imposed by historic design and manufacturing problems. Today, the new SRT offers a utility company an opportunity to improve its service and its revenue, with the use of a low-cost device that achieves very desirable results.

### Better Revenue

What the SRT offers the utility company is a solution to the low-voltage problem—which causes low monthly billing and inferior performance of electrical appliances and lights for the individual customers. The conventional step regulator in the line can at best average out the voltage problems. The SRT corrects the voltage right at the point of consumption—the customer.

### More Economical Regulation

Under normal conditions, SRT will prove more economical than other means of voltage correction. This opens unlimited horizons to the distribution system design engineer for more effective and efficient planning.

### Available For Tests

The initial production run of these units will be sold to progressive companies to explore the benefits available from this new development.

We realize that all companies must of necessity keep their income up and their costs down. We feel that the SRT will make a substantial contribution toward both of these goals.

### Get the Detailed Facts

L-M Field Engineers and Apparatus Specialists will be calling on our customers as quickly as possible to provide detailed information about the SRT. If you would like this information, please get in touch with your L-M Field Engineer, or phone or wire me at Line Material Industries, Milwaukee 1, Wisconsin. We shall be glad to provide you with the details about this revolutionary engineering development.

LM®

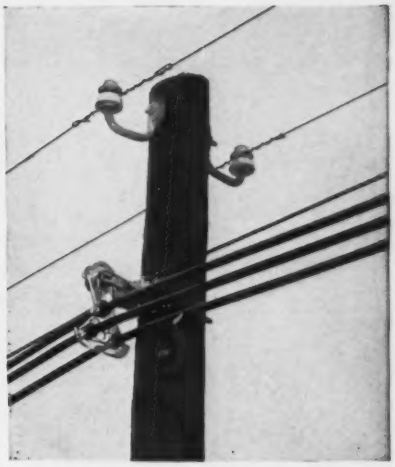
McGRAW EDISON

Distribution Transformers

TEAR OUT ALONG THIS LINE AND FILE THIS FOLDER FOR REFERENCE

SRT Transformer

# *New Roeclamp* with Roeplastic® Cable Costs 60% Less than Self-Supporting Cables, Minimizes Tree Problems, Installs with Ease, Looks Better!*



New Roebling ROEPLASTIC Cable with ROECLAMP requires only one foot of clearance through trees! Note improved, compact appearance. No crossarms are needed.

Designed for 5kv systems (2400/4160Y and 4800 v delta) and 8kv systems (4800/8320Y and 7200 v delta), the Roebling Aerial Spaced Cable actually costs 60% less than conventional self-supporting cables. It provides a neat, compact appearance, improved voltage regulation, higher current-carrying capacity, and positive phase identification.

Up to three conductors can be carried by ROECLAMPS, which are suspended from a strong messenger. The messenger also provides protection against lightning and falling limbs.

Aluminum conductors come in 17 standard sizes and strand constructions, and are made with a greater number of finer strands for extra flexibility. Standard insulation is extruded ROEPLASTIC P-11R7 (other extruded insulations available). ROECLAMPS come complete with grommets to fit cables and messenger you order.

Ask your Roebling representative to show you the remarkable new ROECLAMP. He'll tell you more, too, about the unusual savings and improvements you can effect, or write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

**ROEBLING**

*Branch Offices in Principal Cities*
*Subsidiary of The Colorado Fuel and Iron Corporation*

## *Roeclamp has unit construction... installs in seconds—without tools!*

One motion and ROECLAMP is on messenger and ready to receive conductors. Phase changes and repairs do not necessitate removal of clamp. ROECLAMP comes complete with grommets to fit messenger and conductors you order.

Note how easily conductors drop into place. Installation is measured in seconds, even with "boxing gloves" on. ROECLAMP is Plexiglas†, tests to over 1000-lb. breaking strength, offers outstanding weather resistance, best possible electrical properties.

35 ROECLAMPS are required every 1000 feet. Installation is completed by hand-tightening of nut. Not even a screw driver is required!

*Pat. pending
†Reg. T.M.—Rohm & Haas Co.

No. 1 of a series...

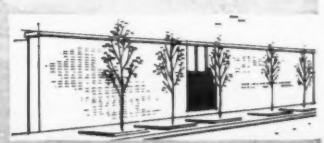
# the dead-ends* you never see improve the ones you buy

RESEARCH & ENGINEERING TEST SAMPLE
TYPE OF TEST Corrosion
EQUIPMENT USED Salt Fog Chamber
SPECIMEN NO. 10
TEST STARTED 3/24/58 9 a.m.
TEST TERMINATED 5/23/58 2 p.m.
10

Most metallurgists and product design engineers are aware that laboratory corrosion tests have relatively little quantitative significance in terms of predictable service life. The only valid conclusion which may be drawn from such tests is that the particular samples tested had a certain relative resistance to the specific corrosive environment in which they were placed.

Nevertheless, corrosion proof-testing is considered an essential phase of product quality control at the Preformed Research and Engineering Center. In addition to conventional raw material quality control procedures, observations of relative corrosion rates are also made on finished products. As an example of objective performance standards used, Preformed Guy-Grip dead-ends are required to have corrosion resistance exceeding that of the strand for which they are designed. To assure compliance with these minimum quality standards, samples taken routinely from production are applied to strand specimens and exposed to a severe corrosive environment under closely controlled laboratory conditions. Periodic inspections are also made of field test specimens installed at locations throughout the country which are considered to be representative of extreme marine and industrial contamination. This constant laboratory and field surveillance has undoubtedly been largely responsible for the fact that there has never been a report of a Preformed Guy-Grip dead-end having failed in field service due to corrosion.

Jon R. Ruhlman, Vice President
Research and Engineering

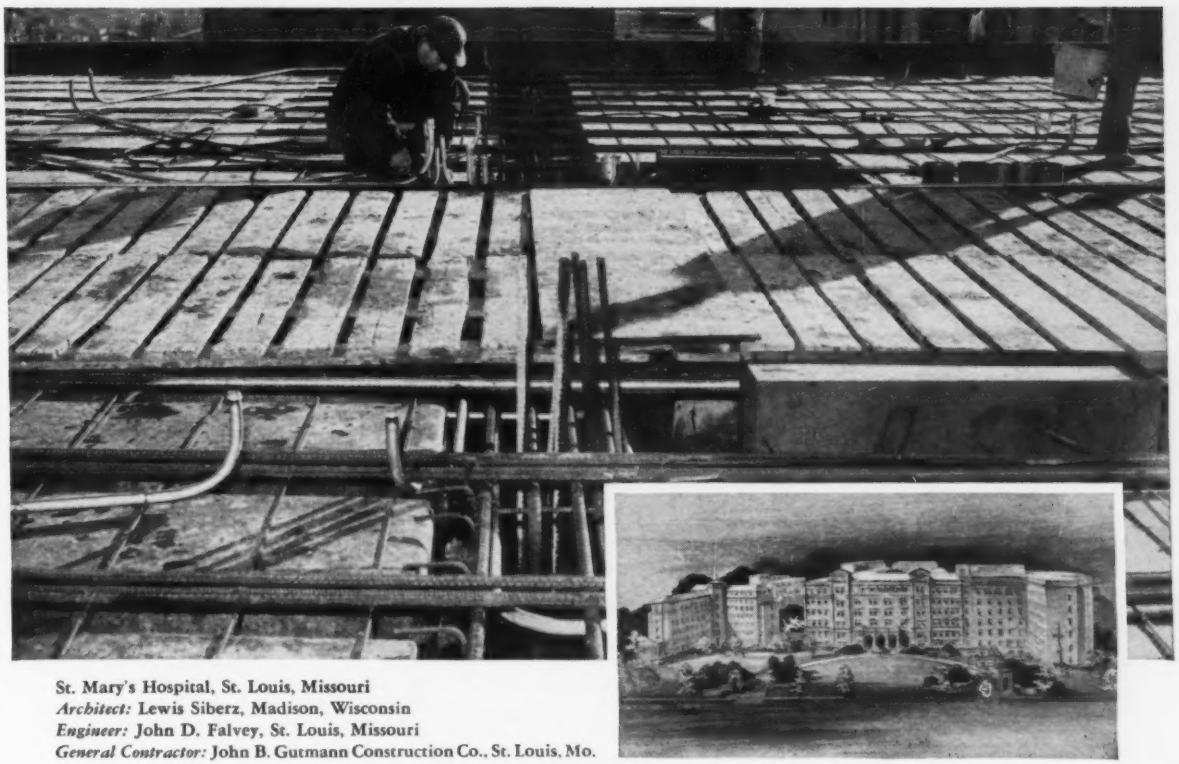


Research and Engineering... another reason why...

*You can look up to* **Preformed**

PREFORMED LINE PRODUCTS COMPANY • 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable: Preformed-Cleveland... manufacturers of armor rods, dead-ends, Guy-Grip dead-ends and other line accessories.

* Made in accordance with or for use under Patent No. 2,761,273; other patents issued and pending.



St. Mary's Hospital, St. Louis, Missouri
*Architect:* Lewis Siberz, Madison, Wisconsin
*Engineer:* John D. Falvey, St. Louis, Missouri
*General Contractor:* John B. Gutmann Construction Co., St. St. Louis, Mo.

## Republic ELECTRUNITE E.M.T. offers installation advantages that prove...

# THE BEST COSTS LESS INSTALLED

Republic ELECTRUNITE® E.M.T. is the only electrical metallic tubing that offers you the three installation advantages that prove . . . the *best* costs *less* installed!

ELECTRUNITE E.M.T. features exclusive, easy-to-measure "INCH-MARKS®". No need to lay a flat rule on the round tube. Exclusive "INSIDE-KNURLING" on popular sizes makes wire pulling up to 30% easier. Accurate bending is assured when you follow the full-length "GUIDE-LINE" and use the Republic Bending Tool.

ELECTRUNITE E.M.T. is produced from highest quality flat-rolled open-hearth steel made in Republic's own mills and carefully inspected to Republic's rigid manufacturing requirements.

And, ELECTRUNITE E.M.T. is approved in The National Electrical Code and meets . . . Underwriters' Laboratories Standards, Federal Specification WW-T-806 (latest revision) and A.S.A. specification C.80.3.

Learn more about these advantages. Call your Republic ELECTRUNITE distributor.

**REPUBLIC STEEL**
**STEEL AND TUBES DIVISION**

REPUBLIC STEEL

**Cleveland 8, Ohio**

**REPUBLIC STEEL CORPORATION**
**STEEL AND TUBES DIVISION**
**DEPT. C-4345-A**
**216 EAST 131st STREET • CLEVELAND 8, OHIO**

I would like to learn more about Republic ELECTRUNITE E.M.T. features and installation advantages.

Name_____ Title_____

Company_____

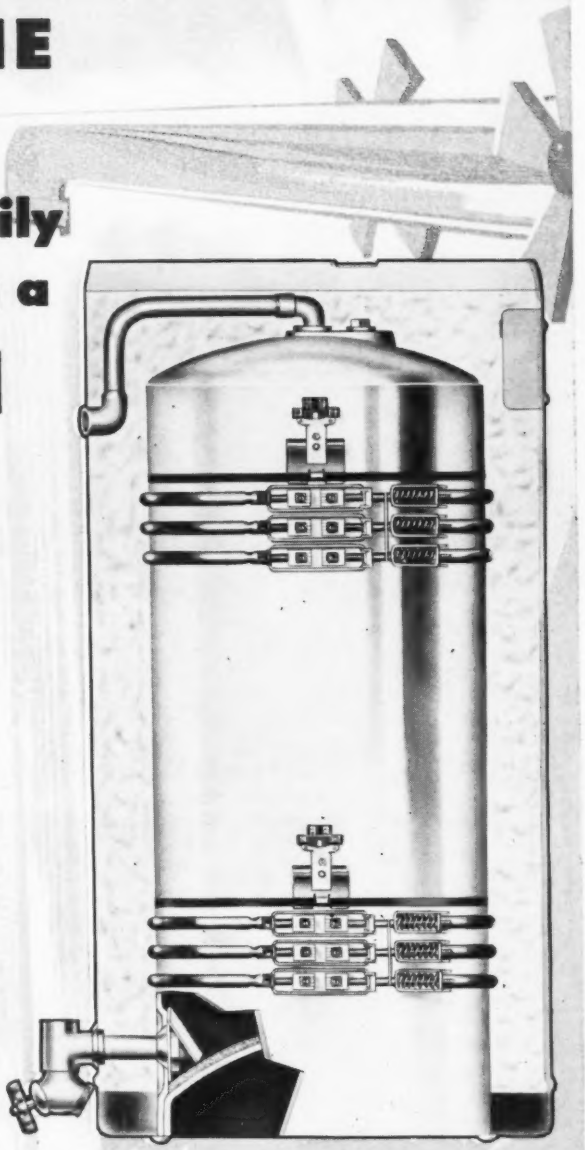
Address_____

City_____ Zone____ State_____

# NOW—ALL THE HOT WATER

## that any normal family will ever want—from a

# 40-GALLON TANK!



**New Hotpoint SUPER-SPEED Water Heaters are *RIGHT* for 95% of your customers.**

Here's tremendous hot water production in a bare minimum of space. Calrod® Magic Circle heat delivers 470 gallons of hot water every 24 hours...and it will raise 18 gallons 100° in just one hour. Even from a cold start, it will heat water for 3 shower baths in 25 minutes.

Hotpoint Quick-Recovery Water Heaters save space and simplify installation. And the new miracle MLC-7 additive in Perma-Seal models can increase the life of the tank by 200%!

SUPER-SPEED Water Heaters will help you put more POWER in "House-Power"—more LIVING in "Live Better . . . Electrically!"

# Hotpoint

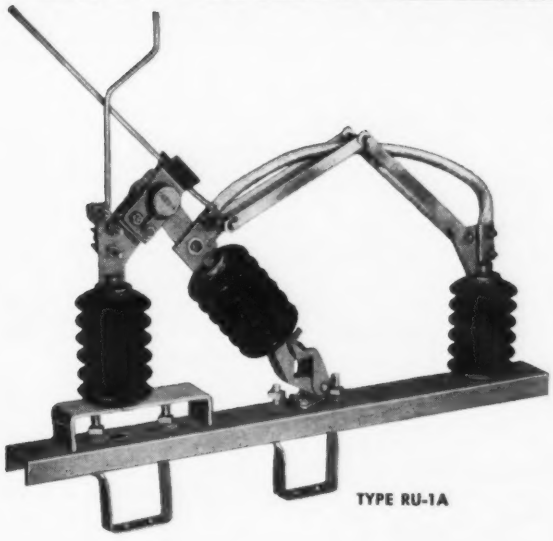
LOOK FOR THAT DIFFERENCE! (your customers do!)

HOTPOINT CO. (A Division of General Electric Company), CHICAGO 44, ILLINOIS

ELECTRIC RANGES • REFRIGERATORS • AUTOMATIC WASHERS • CLOTHES DRYERS • COMBINATION WASHER-DRYERS
CUSTOMLINE • DISHWASHERS • DISPOSALLS® • WATER HEATERS • FOOD FREEZERS • AIR CONDITIONERS • TELEVISION

# For low-cost switching choose a Southern States tilting insulator disconnect

TYPE TR-1A



TYPE RU-1A

## TWO COMPLETE LINES

When easy, low-cost installation is the first requirement for disconnecting switches, Southern States offers you not one —but two complete lines from which to choose.

The Type TR-1A is a high-quality rocker-type disconnect that meets NEMA Standards in every respect. It is available in voltage ratings from 7.5 kv through 69 kv and continuous current ratings of 200, 400, and 600 amps.

The Type RU-1A is a distribution level tilting insulator switch specifically designed for pole-top mounting. Its dielectric strength is the same as standard levels for other distribution equipment, but it is below NEMA Standards for power switching equipment. It is available in voltage ratings of 7.5 and 15 kv and continuous current ratings of 200 and 400 amps.

Both types are ruggedly constructed, and will provide reliable switching under all service conditions. Many utilities throughout the nation have found in these switches the answer to their needs for low-cost, easily installed disconnecting switches. So can you. Get full details in our Bulletins 54 RU and 3050.

## EASY INSTALLATION

One reason utilities find the installation of these switches so easy is the method for affixing the interphase shaft to the rocking insulator. The shaft is laid in its proper position across all three phases and then only one bolt per phase is tightened to complete the installation, saving valuable installation time in the field.

**SOUTHERN STATES**
**EQUIPMENT CORP.**
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

# Control Cable Savings Begin with Small Diameters

SPECIFY & BUY
ROCKBESTOS
PNR
600 VOLT CONTROL CABLE

## For New Work or Rewiring...

**PNR**—Polyethylene • Nylon • Rockhide (PVC)

## HERE'S THE PROOF WHEN IT COMES TO CONDUIT FILL

| No. 12 A.W.G. (19/25) | | 1 CABLE PER CONDUIT | | | | 2 CABLES PER CONDUIT | | | | 3 CABLES PER CONDUIT | | | | 4 CABLES PER CONDUIT | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Max. Cable Dia." | Number of Conductors in one Cable | | | Max. Cable Dia." | Number of Conductors in one Cable | | | Max. Cable Dia." | Number of Conductors in one Cable | | | Max. Cable Dia." | Number of Conductors in one Cable | | |
| COND. SIZE. | | Table 11 N.E.C. | ROCK PNR | 3/64" | 4/64" | Table 11 N.E.C. | ROCK PNR | 3/64" | 4/64" | Table 11 N.E.C. | ROCK PNR | 3/64" | 4/64" | Table 11 N.E.C. | ROCK PNR | 3/64" | 4/64" |
| ½" | New Work | .450 | 2-4 | | | .243 | | | | .234 | | | | .195 | | | |
| | Rewiring | .479 | 2-4 | | | .276 | | | | .252 | | | | .218 | | | |
| ¾" | New Work | .598 | 5-7 | 2-3 | | .323 | | | | .311 | | | | .260 | | | |
| | Rewiring | .636 | 5-8 | 2-4 | 2 | .367 | | | | .335 | | | | .280 | | | |
| 1" | New Work | .762 | 8-14 | 4-7 | 2-4 | .412 | 2-3 | | | .396 | 2 | | | | | | |
| | Rewiring | .811 | 9-16 | 5-8 | 3-5 | .468 | 2-4 | | | .427 | 2-3 | | | | | | |
| 1¼" | New Work | 1.000 | 15-19 | 8-12 | 5-8 | .543 | 4-5 | 2-3 | | .523 | 3-5 | 2-3 | | | | | |
| | Rewiring | 1.070 | 17-19 | 9-16 | 6-9 | .618 | 5-8 | 2-4 | | .564 | 4-5 | 2-3 | | | | | |
| 1½" | New Work | 1.170 | | 13-19 | 9-12 | .634 | 6-8 | 4 | 2 | .610 | 6-7 | 4 | | | | | |
| | Rewiring | 1.248 | | | 10-14 | .721 | 9-11 | 5-7 | 2-4 | .658 | 6-9 | 4-5 | 2 | | | | |

This is an excerpt from the Rockbestos Control Cable Conduit Fill Chart covering sizes A. W. G. 9, 12, 14. Write today for your free copy. Ask for PNR 1-58.

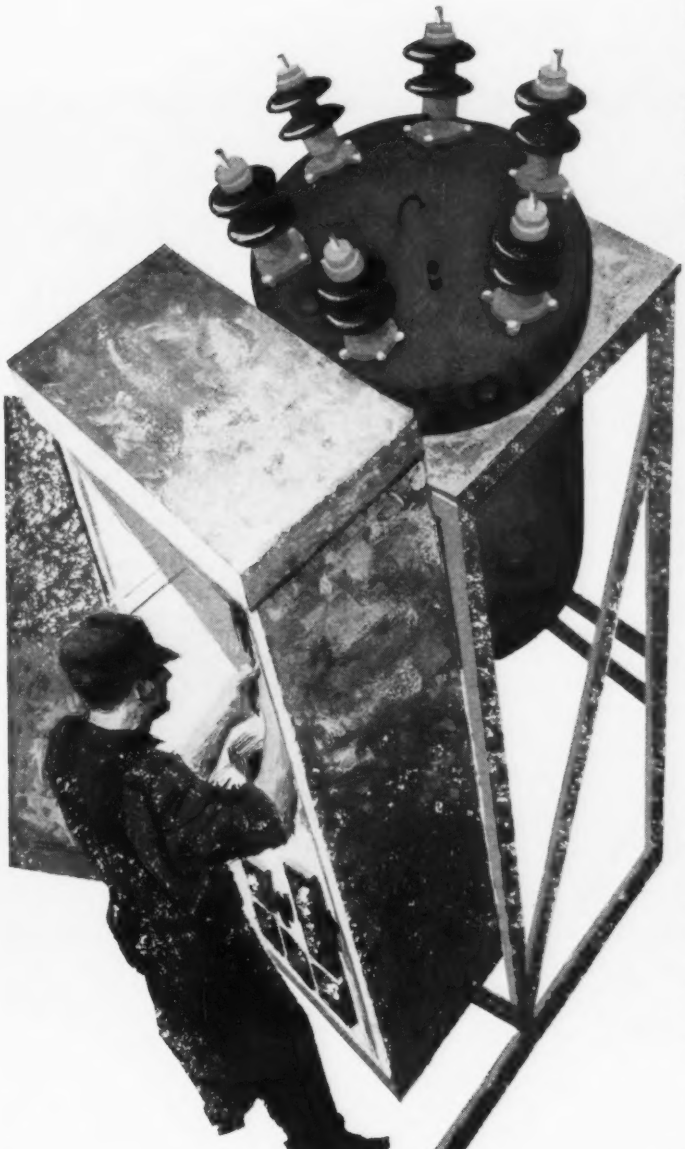
**ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONNECTICUT**

NEW YORK • CLEVELAND • CHICAGO • OAKLAND • LOS ANGELES • PITTSBURGH • ST. LOUIS • DETROIT • SEATTLE • ATLANTA • DALLAS

# ROCKBESTOS

**PNR Small Diameter Control Cable**

**MORE THAN 16,000,000 FEET IN SERVICE**



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A forward-looking breaker design program, coupled with thorough High Power Lab testing, produced the Type G frame-mounted, single-tank breaker . . . providing system protection and continuity of service unmatched in the industry! These distribution breakers are designed to the ASA Large Power Breaker Standards.

Top coordination of system relaying can be provided by separate phase and ground relays. Any type or combination of relays can be used to provide maximum flexibility. Varying system requirements can be met without changing basic breaker components.

The magnetic De-ion® grid and solder-sealed condenser bushing were adapted from big breakers to offer reliable high-voltage breaker performance.

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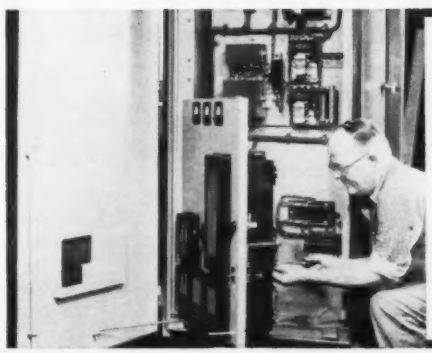
Type G breakers are available rated: 14.4 kv, 600-1200 amp, with interrupting capacity of 100-250 mva; and 23 kv, 600 amp, 250 mva. Maximum interrupting time: 5 cycles.

To learn how you can have big-breaker performance in your distribution substation breakers, call your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-60958

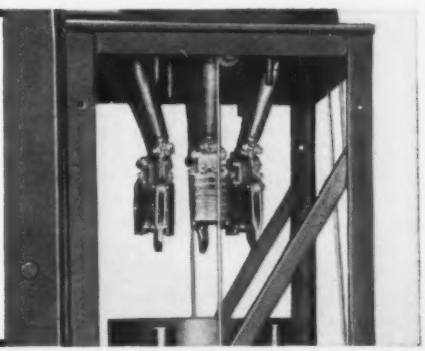
YOU CAN BE SURE...IF IT'S

**Westinghouse**



Staggered interrupters give complete phase-to-phase insulation. Hinged moving contacts provide positive guiding action . . . simplest operating linkage. Since single-phase faults may occur more frequently on one particular phase, three phases in one tank make optimum use of all of the oil . . . minimize maintenance.

Relays and operating mechanism both located in cabinet of breaker to trim space requirements. Hinged relay panel provides easy accessibility for inspection or maintenance.



## ELECTRA'S HUSBAND

# "Think" vs "Do" and the Machine

A shower of water from a teenager's watermelon dive shocked us back into this world. We had been taking advantage of the kind of friendship that makes dozing off possible and, at the same time, recovering from the tensions and excesses that go with a couple of conventions.

Electra exploded, "Gentlemen, that was our supreme offering to the world of tomorrow!"

Paul laughed, straightened himself in the chair, and then volunteered, "Well, there's one thing about the actions of our supreme offerings that I admire—they take action, and plenty of it."

Electra, still ruffled, gave up on her splattered hair, and said, "So what good is action?"

"Well, this action, like the actions of my kids," said Paul, "was the result of all "do" and no "think." But the reverse is just as bad. All "think" and no "do" is even worse, and that certainly is a vice of maturity, just as impetuous action goes with youth."

"For instance?" challenged Electra. Paul was one of her favorite sparring partners.

"Well," considered Paul, "let's talk about the conventions that we just concluded. Everyone seemed to feel that this year's meetings hit a new high in terms of the impact of what the speakers had to say. The ideas were well delivered, but the impact came not in how it was said but in what they said."

Electra hadn't caught the point, so she impatiently and suspiciously said, "So what has a good convention got to do with grown-ups' propensity for thinking but not doing?"

"Well," smiled Paul, "the convention speakers represented probably a dozen lifetimes of the best thought in the field of their specialties. This is lots of 'think' which won't be matched by 'do' come Monday morning."

Electra turned to me appealingly. "You mean people are going to go back and do nothing about all those wonderful ideas?"

"Well, 'nothing' is a pretty strong word," I calmed, "but if all the good ideas that you hear at conventions were placed end to end, and this year there've been some dandies, you'd have—"

"Status quo!" chimed in Paul.

"You men!" fumed Electra.

"Look at it this way, Electra," I said. "Very few people make changes of any kind unless there's some kind of urgency or discomfort as a result of not taking the action. Most businesses function that way. The electrical industry is no different."

"But it *is* different," urged Paul. "In most businesses, the result of not being forward-thinking and forward-doing is a loss of business and profit position. Once this is identified, the situation can usually be rectified by hard work and maybe a new face or two in the trouble spots. But in the utility field, failure to be progressive represents a breach of public trust, and the public has proved time and again that they can be plenty vindictive, and that many of their actions are irreversible. You know as well as I do that behind closed doors you will be told that many of the public bodies in existence today are there because some one guy failed to perform many, many years ago. Some of the attitudes of regulatory bodies and politicians are the result of similar causes. And, here again, we have the irreversible reaction."

"What you're saying," beamed Electra, "is that the utility business really takes better management than the average American enterprise."

"Yes," added Paul, "and that the measuring stick for this management should not be conservation but positive action."

"Yes," agreed Electra, "and a shock treatment every once in a while—like that splash of water."

"Yes, something like a little memo from the president to each person who goes to a convention with the simple question: what did you learn at the convention, and what are you doing about it?"

"Would that be a shock to some of these electrical fellows!" smiled Electra. "You know sometimes electric shock can be fatal."

"Well it would hardly be fatal unless there was a lot of voltage back of it," and I too smiled at the thought of the griping that would go on that Monday morning the attendees of the convention found that memo from the boss on their desk. The heat dissipated in that form of fusion would run a small generator. But would it generate any action?

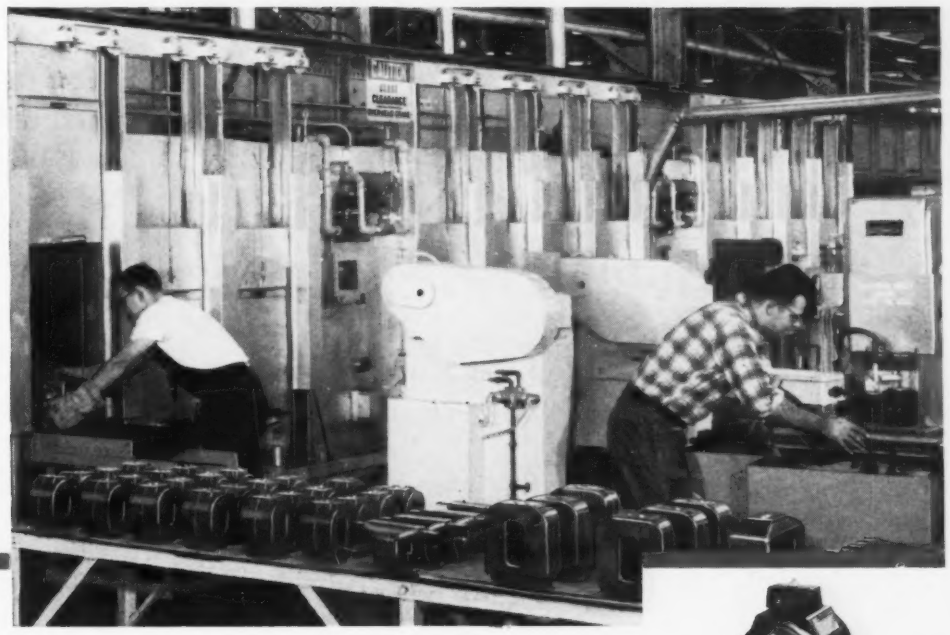
In a larger sphere, this so-called recession—it has as many names as a baseball umpire—is something of a shock treatment to the entire nation, if we will only spark some action from it.

"Come on, you two," I challenged. "That's enough 'think' from you now on this complicated subject. Let's have a little 'do' from you. Get into your bathing suits and let's get into the water ourselves, not just brush it off as another brash idea of the teen-agers. Come on, let's get into the swim with the youngsters. And may the electrical industry do the same!"

A second thought on all this "think" vs "do," and a disturbing one too, is that as we approach the "computer era" electronic gadgets may take over all of the thinking required, leaving nothing for us humans but action if we are to survive. The more that policy becomes a matter of sticking to the past and it's proved and therefore safe procedures the quicker policy can be punched on a card and put through a machine.

Sometimes we suspect that a great many conventions and conferences might well be just tape recorded in advance and played to audiences of dummies, for all the response that they get from live people sent to attend them.

Rather frightening, isn't it! Especially so should Internal Revenue get ruthless on expense accounts. Just think what that would do to mechanize conventions, or eliminate them altogether. It is enough to drive us to *action*.



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Allis-Chalmers expands production capacity to meet fast-growing demand for

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4. Can be installed in any position . . . quickly, easily.

A number of new type instrument transformers for various applications have been added to the line. Additional types are now under development. Your nearby Allis-Chalmers office will give you details, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A5685

**ALLIS-CHALMERS**

**Type TWM** — 600-volt, indoor-outdoor light duty metering transformer for 200 through 800-ampere use. Window— 1⅜" x 2¾"

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**Type BKM** — 600-volt, indoor-outdoor heavy duty metering transformer for 2000 through 4000-ampere use. Window — 4¼" square.

**Type BKAW** — 15,000-volt, outdoor heavy duty metering transformer for 1200 through 5000-ampere use. Window — up to 8¾" dia.

# editorial views

## Unionized Professionalism?

SOMETHING less than 10% of the professional engineers and scientists of the United States are now unionized, according to a report made before the annual meeting of the National Society of Professional Engineers held in St. Louis last month. NSPE reports that some 40,000 "professionals" are represented by 28 collective bargaining units whose membership is predominately technical or professional. Of this number not more than 30,000 are dues-paying members. Of the 28 bargaining units listed, those in aircraft, federal and municipal power organizations, and large manufacturing plants of the chemical and electrical type predominated.

Unionization of professional people of any category could be deadly to individual initiative and could stifle scientific progress as a whole. The restrictive union practices existing in the craft unions could be applied to professional work as well. While the present status of professional unionism is not alarming, management, of which most professional engineers are a part, should take every precaution to see that the elements which encourage the banding together for mediocrity are not present in the organizational structure of the country's corporations.

## No Monopoly on Brains

PROBABLY the most truly international meeting in the world is the International Conference on Large Electric Systems (CIGRE) at which electrical engineers from all over the world gather for discussions every two years in Paris. The meeting is unique in many respects. It lasts for ten days, during which time literally hundreds of erudite and highly technical papers concerning electric system equipment and operations are discussed. Representatives from Russia, the Iron Curtain countries and Red China mingle with those of the free world without even a hint of the wide divergence of political ideologies that exist. If there ever was a demonstration that the exchange of engineering and scientific information recognizes no political boundaries, the CIGRE meeting is excellent proof. The conduct of the sessions, too, is unique by American standards for papers are only discussed, the delegates having received preconvention copies for study beforehand. All in all, the program represents a vast accumulation of experience, research and advanced thinking.

Perusal of the papers themselves is startling confirmation that no one area of the globe has a monopoly on technical brainpower or creative thinking. This year Soviet delegates reported on the experience with studies on transmission lines of the 600-kv, a-c category and 800-kv, d-c range. Another Russian described a synthetic circuit for testing the interrupting capacity of large circuit breakers. Japanese utility men told about the technique they have developed for burying submarine cables by use of an undersea water jet-type burying machine and a new method of controlling power flow in a 220-110-kv loop system through a combination of a series capacitor and phase-shifting transformer.

Swedish and French cable manufacturers described very promising developments in forced oil cooling for 400-kv power cables which would materially extend the length and capacity of such circuits. Canadian engineers told of a hybrid wood pole design wherein the center conductor is overdimensioned as a means of reducing interference to a minimum. A Polish professor revived the theory of protecting substations against lightning effects by the use of inductance coils and capacitors and supported his findings of reduced lightning arrester duty with laboratory and field test data.

Another interesting concept was pre-

sented by an Austrian engineer who described the use of underground cable buses for outdoor substation designs. The use of the underground high-voltage cable as the station bus bars not only improves appearance but offers substantial savings in station area.

Delegates from Red China presented papers on substation construction in that country with particular reference to the use of present reinforced concrete frame structure, a type of design which appears to be particularly suitable economically for that country.

The above are only a few examples of the truly international flavor of the CIGRE meeting. It is intriguing to reflect that all over the world some of the best engineering minds are concentrating on problems pertinent to the electric supply systems of the world. Out of all this there cannot help but come new ideas, new concepts and new data which, if exchanged as freely and fully as is done biennially in Paris, cannot help but result in progress.

## Better Sell Now

THERE is double meaning in the phrase "Better Sell Now." Times are such that it is a good idea to get out and step up sales activities from a quantitative standpoint. Now also is the time to improve sales techniques to get a better quality of selling and more productive results per unit investment of sales time and effort.

The Pacific Gas and Electric Co. is spearheading a campaign in northern California to encourage consumers to buy now. This is leadership of the first order and the campaign throws the whole weight of the utility's advertising and promotional program behind an effort to encourage consumers to buy appliances and television. This is timely leadership in cultivating prospects for the industry's products and in stimulating buying action. However, the program will leave much to be desired unless manufacturers, distributors, dealers and contractors put some real selling effort into the campaign.

Better selling basically is the reapplication of simple sales principles that have almost been forgotten in the lush postwar years. In practically every industry no one is selling as aggressively as he should nor as well as he knows how. No matter how many times the customer is exhorted to buy now by radio, advertising and direct mail, nothing much will happen until somebody asks for the order. The secret of better selling is in setting up merchandising programs that will bring salesmen face to face with more customers and prospects—and then making sure that these prospects are asked to buy. That way, by the sheer average of percentages, more business will be developed. If sales, profits and the economy are to move up, more selling and better selling must be the order of the day.

## Stimulant to Recovery

*FORMULA for recovery from the current business recession —without bringing on more inflation:*

*We must have no wave of wage and fringe rises.*

*There should be no lifting of prices by industry.*

*We should cut government expenditures, not only to provide for additional weapons and balance the budget but also to the point where we can have a tax reduction. This would be the greatest possible stimulant to recovery.*— Former President Herbert Hoover.

# S-1 meter socket EARNS UTILITY ACCEPTANCE

Chances are you're using General Electric S-1 square sockets on your meter installations right now . . . for the S-1 has been placed on acceptance lists by more utilities *throughout the country* than any other socket in its class.

Reason: it has the high quality that today's improved meters demand of a socket . . . quality that protects your meter investment by helping to sustain accuracy and performance throughout the long life of the meter.

In the dependable S-1 socket, you'll find the combination of features meter men look for . . . versatile mounting, positive grounding with either lay-in bus-type or serrated-strap grounding terminals, and pre-scored knockouts. Attractive design, too, plus full 100-amp capacity and plenty of room inside for quick, easy wiring and installation. It's made of rugged, lightweight aluminum that's weathertight and corrosion-resistant.

No wonder so many utilities are switching to the S-1 . . . industry's *only* quality square socket manufactured right beside quality meters. Ask your General Electric Apparatus salesman. He'll show you more reasons why the S-1 is the most popular square meter socket in its class. Or, write to General Electric Co., Section 628-12, Schenectady 5, New York.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

**ELECTRICAL WEST**

VOL. 121, NO. 1
JULY 1958

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

**Each of us can learn from this sound advice given electrical inspectors . . .**

# Public Relations Are In Everything You Do

**Barney Alverson**

President, Southwestern Section
International Association of Electrical Inspectors

Any time that you deal with the public, individually or as a whole, you are confronted with public relations. Even your friends and neighbors are a product of your public relations. Every company and organization from the President of the United States down through the Cub Scouts are concerned with public relations.

Millions of dollars and endless hours are spent each year in the various media in an untiring effort to promote good or favorable public relations. The displayers, the factory representatives, at any trade show or convention are there to do a public relations job. Every meeting is held, in part, to better public relations.

You, as an inspector, say "Sure, they've got something to sell, but I haven't. How can public relations affect me?"

Let me dwell just a minute on the political aspect. If you work for a governmental body, then directly or indirectly there must be politics involved; the city council, county supervisors, your department head, someone above you is a politician. Your very job is probably established by political means, either by directive, by ordinance, by referendum or law.

As you meet the public, you automatically become the symbol of the political council member or supervisor or department head. You are the government you represent. This opinion or public relation, if you will, largely determines the status of your welfare as a public employee.

On the job, too, your reception, your working relations and your ability to get compliance is largely a product of your public relations.

I think we've established that public relations do affect you as an inspector, so let's try to determine what public relations are and how we can improve them.

Public relations are a result of two factors: (1) performance plus (2) reporting.

Performance consists of many things—how we look, what we do, what we say, how we say it, how we answer the phone.

Reporting is letting people know about our performance. Reporting means good publicity by press, by radio, by word of mouth. To a great extent reporting takes care of itself. Performance, on the other hand, depends entirely on us.

If an inspector is not completely convinced that his job is necessary for protection of life and property and an indispensible factor in the healthy development of the community, his attitude will be a negative and defensive one. His only refuge will be blind authority. He will consider each inspection as a personal direct challenge or will avoid controversy by lack of enforcement. Neither is desirable and only forces a further retreat from doing an honest forthright job.

An inspector must believe in his job and, in addition, must sell his beliefs to those whom he serves.

### The Why of It

When he was selected to head the department to enforce a new electrical inspection ordinance as chief inspector for San Bernardino County in 1949, Barney Alverson faced a difficult organization job. That California county is as large as five eastern states combined, the largest county in the nation. It comprises raw Mohave desert and urban communities as densely populated as adjacent cities. To cover it requires a large staff of inspectors, not all of them electrically trained for they also must inspect for building and plumbing codes. Since the chief inspector cannot possibly be everywhere at once to settle all disputes, Alverson set up training classes at San Bernardino Valley College. In these public relations became of first importance. It is far better to sell compliance than to have to fight for it. When Alverson was made vice-president of the Southwestern Section of IAEI, he initiated the workshop idea to get constructive action from code discussion rather than endless and often jumbled talk. Now as president of the section his major project is to establish educational courses for inspectors to use in local groups to better train themselves. Public relations will be a major part of such courses. At several IAEI chapter meetings he has been asked to deliver the accompanying address. In these endeavors he is contributing substantially to the lifting of inspection to a professional status.

Here are some tips on how this can be done.

1. Never display authority haphazardly.

2. Be impersonal—but sympathetic.

3. Have a logical reason for everything you do.

4. You are enforcing a minimum code, not your likes and dislikes.

5. Be clear and explicit in what you ask someone to do.

The inspector most successful in achieving his purpose is the one who relies upon authority the least . . . who continually acquires more knowledge of his job . . . who is tactfully firm, consistent and courteous to all. This can also be phrased as:

Be firm
Be fair
Be friendly

Public relations are in everything you do. That means that you must always be sensitive to the way the citizen you are serving is going to react to your approach and your method, as well as your deed.

Suppose, for instance, John Smith plans to build a home. What can happen when he investigates the zoning subdivision control and building code? Such regulations are complex and technical. If Mr. Smith is handled arbitrarily, if he is shunted from department to department, if he fails to get a simple and clear explanation of his responsibilities and rights, he will forever be alienated even though this may be the only time in his life he will be affected by such control.

### Check List

Because public relations permeate every governmental activity, one of the best ways to keep track of your own public relations rating is to make a check list covering the service your department performs, the types of contact you have with the public and the ways you communicate with the public.

Just "thinking up" the list will give a surprising number of clues about the areas where your public relations are good or bad or even perhaps unknown. Below are some questions that would be included in the check lists of most government departments:

1. **Do you write simple, friendly letters?** Do you make an effort to picture the person to whom you are writing, or does the same question get the same stock easy answer? If you were face to face with the questioner, he would quickly show resentment at cold officious treatment.

2. **Do your regulations make sense?** Have you ever in exasperation fallen back on the argument: "That's the rule and there's nothing I can do about it?" That's as unsatisfactory an answer as "because." If a rule can't be explained simply and logically, it's high time to take another look at the rule.

3. **How do you handle citizen complaints?** Right away is the right way, even those made by "cranks" or "jerks." Then do you follow up to see if the citizen is satisfied? Do you classify complaints so you can detect operating weaknesses they may reflect?

4. **Do the physical conditions in your office give the visiting public an impression of economical, efficient operation?** Even though lady citizens may not run their fingers over the window sills for dust, the work climate makes a powerful impression on the casual visitor. Are your employees good housekeepers? Are the papers needed for the public handy? Do you provide a place for private conversation? Is it absolutely necessary to put the coffee bar at the main entrance to your department?

5. **What about telephone manners?** Do employees answer the telephone cordially? Do they answer questions or know definitely where to get the answer? There is scarcely anything that will raise a citizen's blood pressure higher or faster than being shunted from office to office.

6. **Do employees always know about new policies and regulations before they are announced to the general public?** Do they know why the policies or regulations were changed so that they can interpret them intelligently.

7. **Do you take the initiative to keep local papers informed about your work?** Do you answer reporters' questions fully and honestly? Are top-level officials available to the press? Do subordinates have authority to speak? Do you answer follow-up inquiries on news stories?

8. **How do you get along with some of the "special" groups with whom you must work?** Such as the legislature or council, employee unions, other departments in your government, businessmen's clubs? Maybe you won't always see eye-to-eye with the legislatures or the union, but do you have open aboveboard discussions? Do you trust each other? Group relations can make or unmake a lot of friends at one time.

9. **Do you and members of your staff accept speaking invitations from local organizations?** These are receptive, well disposed, ready-to-listen groups. A golden opportunity to toot your own horn.

10. **Do you ever seek advice or assistance from informed public groups?** When you accept and act on their advice, they feel compelled to support you.

11. **Do you try to make your reports "come alive" or do you just meet the requirements of the law and list the dry statistics?** A good point to remember when writing a report is: "What does this service mean to the individual reader?"

12. **Do you have a plan for follow-up reports to agencies or individuals who have referred a person to your department for information or service?**

13. **Do employees know how their particular job contributes to the total job of your department?** If they do, they will be able to discuss the work more intelligently and will take pride in doing so.

14. **Do you have employees in uniform who should be in uniform?** Are they always well-groomed?

15. **Is your motor equipment identified, painted and washed?** Is it always operated "legally"? Are drivers trained in safe driving and in the courtesy of the road?

16. **Do you furnish identification for employees who deal with the public outside the office?**

17. **Do you ever thank the public or individual citizens for cooperation they have given?**

18. **Can you compare this year's accomplishments with last year's?** Can you put your finger on potential problems? Will your records tell when a problem has been solved, or do you play it by ear?

19. **Do you train your technical employees to talk and write in nontechnical terms when dealing with nontechnical people?**

20. **Who in your organization has specific responsibility for the public relations aspects of your operations?** Does that person have the support of top management?

The above list is meant to be provocative, not exhaustive. Take your pencil and add items that are appropriate for your situation. Then—don't file it away! Check up on yourself regularly. Make public relations a part of your job.

The challenge today for every inspector is to do an outstanding job of public relations to the extent that you will never be considered less than professional, to the extent that your services will be an absolute necessity to the community, to the extent that the community which you serve will be a safer, healthier, a better place in which to live.

**Problems of Management—VII**

# How Not to Grow an Ulcer

**Dr. Joseph G. Phelan, Ph.D.,** Personnel Development Counselor, Bechtel Corp.

Everybody likes to get things done. There are decisions that have to be evaluated, meetings that must be prepared for, production schedules that have to be met. Whatever our job is, we're bent on getting it done. That's where the trouble starts.

Somehow, there are always situations or people who get in our way and prevent us from achieving our goals. People are disinterested, they don't understand, they make mistakes. Some people seem to obstruct us deliberately, others just stumble into the way. Sometimes, fate lets us get within easy reach of our goals, and then turns the table.

Delays, obstacles and disappointments are exasperating and frustrating to all of us. Dr. Argyras of Yale says, "An ability to tolerate a whale of a lot of frustrations is the most important quality that an administrator can possess." With our goals blockaded, some of us don't fare so well. We get irritable or angry, anxious or depressed.

Occasionally, we meet a man who appears to remain calm in the face of conflicts and job difficulties. Although he hides it well, he may well be carrying his anxiety inside. But the mind and body are inseparable, and such sustained feelings of anxiety and tension take their toll in the form of stomach trouble, heart conditions and a variety of nervous habits.

One of our management problems is to enjoy this planetary habitat for many years in good health. Here are some rules that have helped busy management escape "executive's neurosis."

1. **Think it through.** Most problems are not as serious as they seem at first glance. By giving it a good think early in the game, you may find an easy solution; or, better yet, turn a liability into an asset. Call on a respected adviser if you need help. Most people are flattered by a request for advice or counsel.

2. **Do something about the problem.** Don't just fret and stew. Much of the problem of "things hanging over your head" can be solved with aggressive action. Here are good habits you can form to help you get things done.

**Check Your Score on Test, Page 11**

Nos. 9 and 11 are true, the others are false.

3. **Tackle the worst job first.** Wade into a tough problem every morning first thing, when you are best able to crack it. After a while, you will find that the tough problems have vanished, and you will be on easy street.

***Get Off the Worry-Go-Round***

CONGRATULATIONS, BILL! YOU'RE OUR NEW VICE-PRESIDENT. PLENTY OF RESPONSIBILITY BUT YOU CAN HANDLE IT.
HE'S AFRAID OF RESPONSIBILITY. AFRAID OF SUCCESS... I'LL HAVE HIM JUMPING OUT OF HIS SKIN AFTER A WEEK ON THE JOB.
HI TENSION

***Have I Got What It Takes?***

**Every businessman will recognize this fellow. All his working life he has fought to get to the top. Now his big moment has come. Suddenly panic grips him.**

**HiTension is beginning to bore in, create anxieties and undermine his self-confidence. If our friend doesn't understand it's only natural to have a few momentary qualms, he's in for trouble. A mature man knows he can master his fears by facing them. When opportunities come, he accepts them gladly, takes his responsibilities in his stride.**

**If this man hadn't shown plenty of ability during his career, he wouldn't have been chosen for an important job. So what's he worrying about?**

4. **Nail it down.** Make it a habit to finish each job you start. Some successful executives establish records of getting things done by not answering the telephone once they've started on an important task. If it's impossible to finish the job now . . .

5. **Plan it through.** Some problems, particularly those involving people, can't be concluded right now. But they can be *planned through to conclusion.* With a plan and a time schedule set up on your calendar, worrying stops because the problem is being solved as fast as can be expected.

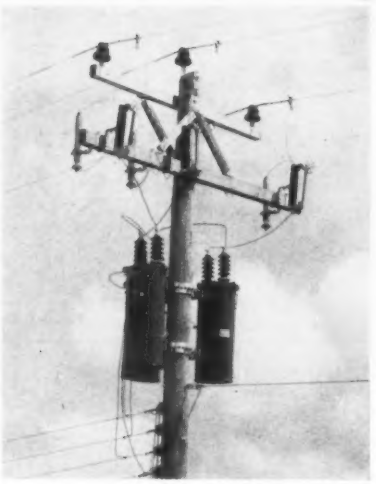
6. **Respect yourself and your abilities.** Tackle your work with the will of a winner. A defeatist attitude hasn't got a chance. Remember, your subordinates are looking to you for leadership. If you are anxious or insecure, you may lose more than just your own best efforts.

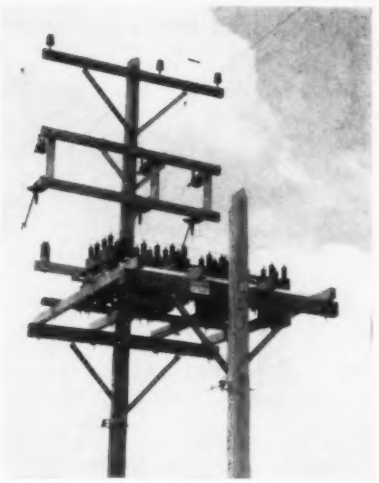
7. **Stop crossing bridges you may never come to.** Don't waste emotional energy anticipating the boss's adverse reaction. He probably won't even notice it. It's one thing to anticipate things that might happen, and another thing to experience fear or panic at the contemplation of some future event. James Russell Lowell said, "Be of good cheer, remembering that those misfortunes hardest to bear are those which never happen."

8. **Be human.** Don't take yourself too seriously. Be able to laugh at yourself and your mistakes. Recognize that others are human too, and that the purpose of business is to make a living—and living is supposed to be fun.

9. **Check your goals.** Business is serious, but not grim. We have to be dedicated, but not intense; ambitious, but not cruel; competitive, but not malicious.

10. **Relax.** Make a deliberate attempt to find some activity that gives you complete mental and physical relaxation.





**Linemen finish the installation of a 20/34.5-kv distribution transformer by connecting the tap to the hot phase. The 20-kv service is considerably cheaper than a 7,200-v rural service. Three-phase and capacitor installations show current distribution practices adequately handle this voltage. Pole-mounted capacitors are also in current use**

**Idaho Power engineers take a forward look at distribution voltages and find . . .**

# 20/34.5 Kv — An Economic Solution

**Don E. Haasch,** Special Studies Engineer, Idaho Power Co.

The electric utility industry is forever engaged with the problem of delivering power to customers at a proper voltage with a minimum of capital investment. With rising costs of labor and material, there is inward pressure to find better solutions to this problem. Since the industry is continually expanding, each solution must be weighed by its ability to perform at loads two to four times as large as today's. Forecasts indicate that our present methods of delivering power will be inadequate in 20 years. Why not find a new way to do the job today?

While Western transmission voltages have pressed upward from 138 kv to 230 kv to 345 kv and even 500 kv, distribution voltages have not kept pace. Twelve kilovolt systems, for many years common in the West, are now regarded as a good voltage for present and near future loads. There is a growing need for line capacitors and line voltage regulators to provide adequate customer service. These are warning flags.

Are we attempting to stay with what we have by the use of crutches instead of looking for a better and more economical method of doing the job?

## I—A Simpler System

The distribution system alone does not determine the cost of plant to serve the load. All the plant from the generator bus to the customer meter must be evaluated. Consider a typical system:

**Conventional Distribution**

1. 138/69-kv substation
2. 69-kv subtransmission line
3. 69/12.5-kv substation
4. 12.5-Y distribution line
5. 12.5-Y kv to 240-v (distribution transformers)

The total average cost per kilowatt for the conversions will run around $140 per kilowatt served, not including generation plant accounts.

On the 20/34.5-kv distribution system, the number of transformations are reduced and the subtransmission substations and lines are eliminated. The steps of this system are as follows:

**20/34.5 Distribution**

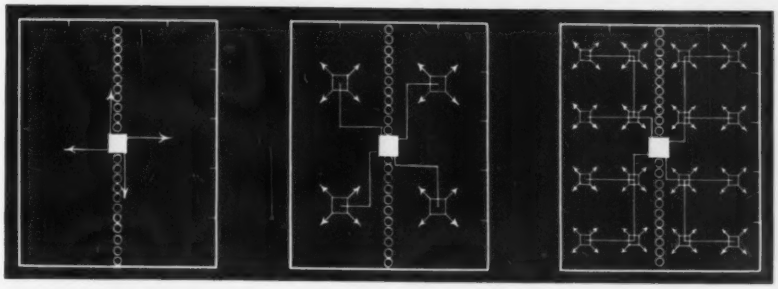
1. 138/34.5-Y kv substation
2. 20/34.5-Y distribution
3. 34.5-Y kv to 240 v (distribution transformers)

The total cost per kilowatt of the load served should run an average of $108 per kilowatt served. It is a saving, and worth trying to realize. The saving is due to the elimination of 138/69-kv substations and 69-kv transmission lines, or $15 and $30 per kw and taking into account the compensating transformers at present-day prices.

Table A is a summary of a design study that covered feeder design sizes from 500 kw to 30,000 kw at the

four voltages and at densities from 12 kw to 30,000 kw per square mile. Analysis showed that below 200 kw per unit area the higher voltages were the cheapest and above 200 kw per square mile, the difference in cost per kilowatt tended to be negligible. The 4.1-kv voltage could not compete except in densely loaded areas, and 12.5 kv fell behind with the larger design feeders in the lighter loaded areas.

But that is not the entire story. Feeder areas are not always regular or the minimum desired size; therefore a chart showing the kilowatt-miles that can be served over minimum-size wire (in this case, No. 4 ACSR) is given in Table B.



| 20/34.5 kv | 7.2/12.5 kv | 2.4/4.1 kv |
|---|---|---|
| 20-mw feeder | 5-mw feeder | 1.25-mw feeders |
| No trans sub | 1 trans sub, 80 mw | 1 trans sub, 80 mw |
| 1 dist sub, 80 mw | 4 dist sub, 20 mw | 16 dist sub, 5 mw |
| 4 feeders, 80 mi/fdr | 16 feeders, 20 mi/fdr | 64 feeders, 5 mi/fdr |
| No subtransmission | 9 miles subtrans | 16 miles subtrans |

**Substation sites hard to get? Which substation pattern will you have in the 1970s? This comparison is made on the basis of 20 sq miles and 4,000 kw/sq mile. Feeder conductors are the same size and loaded economically**

## II—Extra Benefits

Assume a 12.5 feeder fully loaded and with the maximum allowable voltage drop. Suppose also the load is doubling every 10 years. Would you beef up the feeder?

Now consider cutting over to 20/34.5 kv. The feeder capability (load packing strength) has been increased by 4½ times on the same wire, we have also reduced the feeder voltage drop by a ratio of 1:7.5. By going to 20/34.5 kv, it will be 20 years before the problem of voltage regulation or capacity need be considered.

### Loss Savings Valuable

Since losses vary inversely as the square of the voltage, the reduced losses in the 34.5 distribution system will result in considerable saving of investment charges.

Recaptured losses will be available back through the electrical plant to the generator buses. Serving 10,000 kw over a conventional distribution system may result in losses of 600 kw, compounded by additional losses of perhaps 60 kw of losses upon losses in the subtransmission and transmission system.

This loss of 660 kw at the generating plant represents nearly $165,000 at $250 per kilowatt, most of which would be eliminated by using 34.5-kv distribution. This saving of $10-$15/kw can be applied against the cost of change-over to the 34.5 kv. In addition to making more kilowatt-hours available for sale, they are released at the time of peak load, just when the capacity is most needed.

### Safety No Problem

Safety is of prime importance when considering any voltage. Just as surely as 12 kv must be worked with hot sticks, so must 20 kv. No problem can be foreseen than has already been encountered when working 12 kv, other than the fact that the careless lineman who takes a chance at grabbing 7,200 v with rubber gloves must certainly be trained differently when working 20 kv.

Some other items which indicate the applicability of 20/34.5 kv to present systems:

1. Present tree trimming practices are more than adequate for 20/34.5 kv.

2. Line exposure on circuits connected to the new higher voltage should be no more extreme than on the lower voltages. Automatic protective and coordinating devices are presently available so that equal insurance against outages can be achieved on a mile-for-mile basis.

3. Tentative approval has been given to joint construction with telephone circuits.

4. Elimination of some substations? Possibly 20/34.5 kv could eliminate some lower-voltage substations in selected areas, but by and large 20/34.5 kv would merely replace low-voltage substations, allowing much greater kw loads to be served on existing lines without having to buy expensive real estate.

### Manufacturers Cooperate

During the past year, manufacturers have made available a ready supply of 20/34.5-kv, 150 BIL lower cost distribution class equipment. More than one company will supply transformers in sizes from 5 to 500 kva.

**Table A**

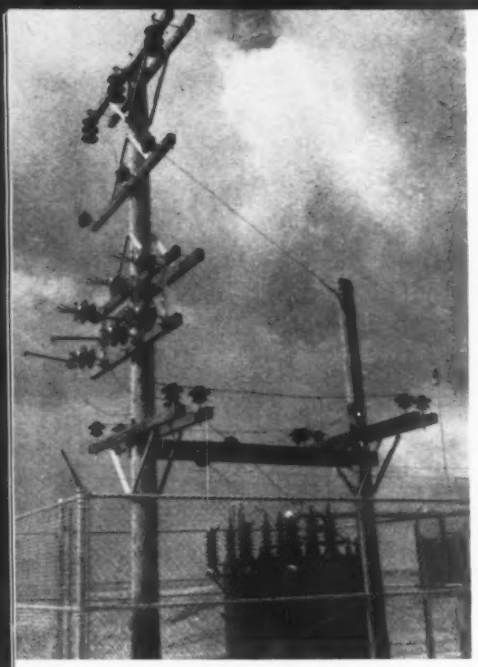
**Cost per kilowatt for fully loaded feeders with a 4% voltage drop on the main feeder and not over 8% drop to last customers**

Dollars Per Kilowatt Invested

| Kw/Square Mile Loads | 2,500-Kw Feeders | | | 5,000-Kw Feeders | | | 10,000-Kw Feeders | | |
|---|---|---|---|---|---|---|---|---|---|
| | 50 | 500 | 2,000 | 50 | 500 | 2,000 | 50 | 500 | 2,000 |
| At 4 kv | 258 | 95 | 19 | | | | | | |
| At 12 kv | 118 | 57 | 17 | 130 | 59 | 18 | 159 | 62 | 20 |
| At 25 kv | 114 | 59 | 17 | 114 | 59 | 18 | 120 | 61 | 18 |
| At 34 kv | 117 | 61 | 18 | | | | 120 | 61 | 18 |

**Table B**

| Voltage | Kilowatt-Miles | Max. Loaded Main Feeder Size With No. 4 ACSR Conductor |
|---|---|---|
| 4 kv | 280 | 560 kw |
| 12 kv | 2,500 | 1,800 kw |
| 25 kv | 10,000 | 3,500 kw |
| 34 kv | 19,000 | 8,000 kw |



**A single distribution sub stepping down from 115 kv does the job of conventional subtransmission and distribution substations**

Lightning arresters of the 27-kv class are available. Insulators have always been manufactured. Arm-mounting switches are a catalog item. Unswitched capacitors on the 34.5-kv distribution line are in operation.

Distribution transformers for 20 kv are now being supplied at special order prices. If they become a standard item and quantity pricing results, they may be reduced as much as $8 to $10 per kva. There is every indication that additional system components, such as voltage regulators, will be available when they are needed.

## III—Will Change-Over Pay?

Any major change in utilty practice, such as the adoption of a new distribution voltage, must be evaluated in terms of total long-time cost. A shortsighted decision today may cost millions tomorrow. On the other hand, the decision in some areas to standardize on 60-cycle frequency, which cost millions at the time, is paying great dividends today. Assuming then that there may be long-term advantages to a 34.5-kv distribution system, Table C has been prepared to illustrate the cost of relieving an overloaded 12-kv substation of 10-mw design by one of three means.

1. The first approach is to build another, supposedly standard, 12.5-kv, 10-mw substation. This approach, then, supposes the procurement of another site and the addition of another building block substation.

2. The second approach is to enlarge the existing substation from 10 mw to 20 mw through the addition of larger transformers and addition of feeders.

3. The third approach would be to convert the existing substation to a 20-mw, 34.5-kv substation, with a design for an ultimate capability of 40 mw.

### Real Savings Today!

The comparison indicates that at this point, where additional capacity is needed, actual economies may result from the change-over because of the savings in subtransmission lines and the additional subtransmission substation. This statement may be challenged on the basis that in any given instance it may not be necessary to construct a kilowatt of capacity clear through the system to the generator bus, but for the purposes of a system-wide decision, this assumption is certainly true. The associated block chart showing approximate system investments from high-voltage transmission lines through to the distribution transformer will indicate the general area where the economy will be made.

### Operating Experience

The test of any distribution system is how well it performs. Idaho Power Co. has had operating experience for almost 10 years with 20/34.5-kv distribution systems. This system now totals 275 pole line miles. The load in 1957 approximated 40 mw, which is almost entirely a pumping load. Also, in the same area, it has had to serve domestic farm customers with 20-kv transformer installations, and has accumulated more than 125 transformer-years of experience with 5-kva and 10-kva transformers (125 BIL) without lightning arrester protection. A good many fuses were blown because of lightning, and two transformers were damaged from all causes. One of the damaged units was a rebuilt 12.5 transformer converted to 20-kv operation, and failure should not be attributed to the voltage system.

In 1958, Idaho Power is expanding the system to serve over 100 new farm customers, because economic studies show that the cost is less than expanding a 7,200-v system initially installed to serve the customers in the area.

It is also considering serving 24 farm customers in a new area with 51 pole miles. Studies indicate that a single-phase 20-kv system will serve the customers at 75% of the cost of the next cheaper plan.

## IV—The Forward Look

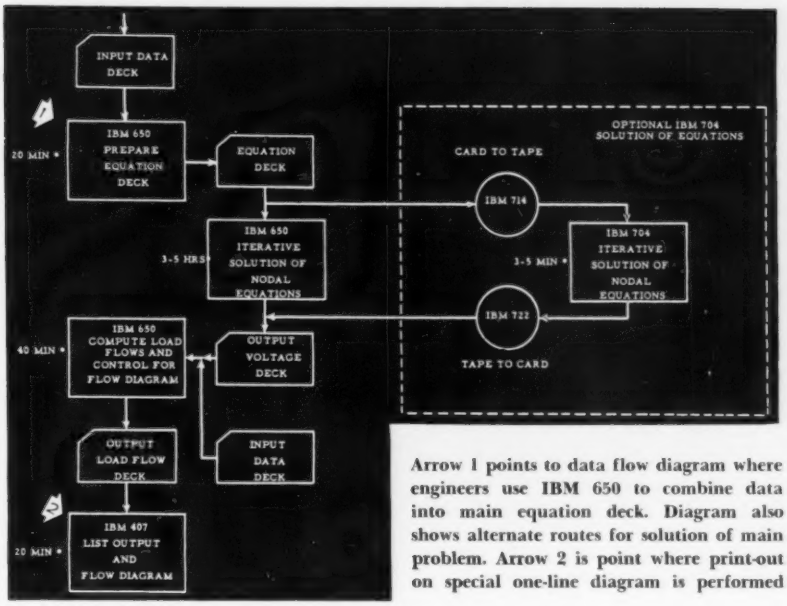
In planning to meet the loads of tomorrow, the company must try to identify tomorrow's problems, then assess their importance in the overall picture. Some of today's minor problems may be the toughest to solve tomorrow. Consider problems such as right-of-way and land costs, substation noise, distribution wire size and pole strength, power transportation losses, voltage drop on conductors, investment per kilowatt of plant.

Evaluation of the importance of these items today and a shrewd estimate of their importance 10 or 20 years from now will play an important role in any decision on distribution voltage changes. You may find the initial step to 34.5 is a better solution for today's problems — as well as a necessity for tomorrow's problems.

### TABLE C—Cost Comparison of Change-Over Methods

| | Build New 12.5 Sub 10-Mw Design | Enlarge Old Sub to 20-Mw Design | Convert to 20-Mw 34.5 Sub of 40-Mw Design |
|---|---|---|---|
| Transmission facilities | $75 | $75 | **$30** |
| Substations (dist.): 10 mw old 10 mw new | 15 | 8 | **18*** |
| Cost of increasing distribution line capacity | 4 | 4 | **1** |
| Transformer change out Net cost of transformers | 0 | 0 | **13** |
| Total cost per kw to serve 20-mw load | $94 | $87 | **$62** |

* $18 takes credit for the 12.5-kv transformer in the old station


INPUT DATA DECK
IBM 650 PREPARE EQUATION DECK
20 MIN *
EQUATION DECK
IBM 650 ITERATIVE SOLUTION OF NODAL EQUATIONS
3-5 HRS *
IBM 650 COMPUTE LOAD FLOWS AND CONTROL FOR FLOW DIAGRAM
40 MIN *
OUTPUT VOLTAGE DECK
OUTPUT LOAD FLOW DECK
INPUT DATA DECK
IBM 407 LIST OUTPUT AND FLOW DIAGRAM
20 MIN *
OPTIONAL IBM 704 SOLUTION OF EQUATIONS
CARD TO TAPE
IBM 714
IBM 704 ITERATIVE SOLUTION OF NODAL EQUATIONS
3-5 MIN *
IBM 722
TAPE TO CARD

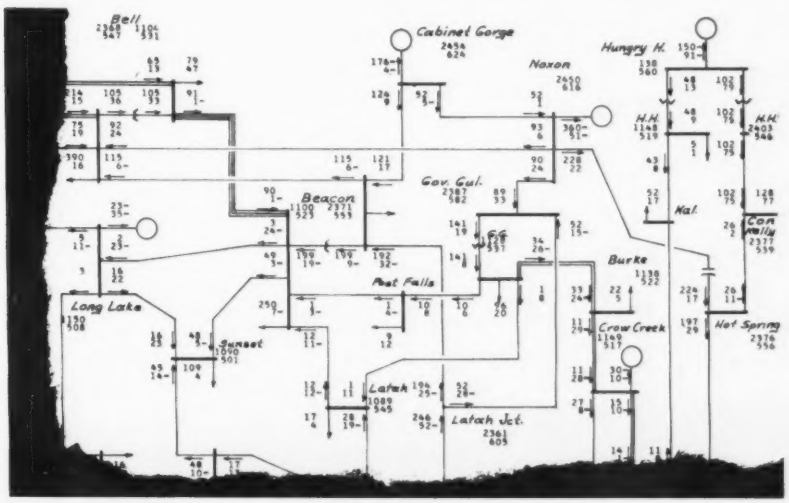
**Arrow 1 points to data flow diagram where engineers use IBM 650 to combine data into main equation deck. Diagram also shows alternate routes for solution of main problem. Arrow 2 is point where print-out on special one-line diagram is performed**

## BPA teaches computer to . . .

# Think Like Engineers

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 037-000-00 BELL | | 110.5 KV | 41.5 DEG | | | | | | |
| 037-001-00 BELL | COU 9 | 107.1-P IN | 5.1 Q IN | 114.2-P OUT | 14.1-Q OUT | 7.13 P LOSS | 19.25 Q LOSS | | |
| 037-033-00 BELL | O 250 | 84.9- | 3.4 | 85.2- | .1- | .29 | 3.53 | | |
| 037-043-00 BELL | BEACO | 143.8 | 5.6 | 142.9 | 4.0 | .92 | 1.67 | | |
| 037 | | .0 P G | .0 Q G | 48.1 P L | 19.8 Q L | .0 Q COND | 29.9 Q CAP | | |
| 037 | CASE 01 | 48.2-P NET | 14.1 Q NET | | | | | | |
| 038-000-00 BELL | | 234.8 KV | 42.8 DEG | | | | | | |
| 038-001-00 BELL | COU 1 | 373.3-P IN | 25.6 Q IN | 386.5-P OUT | 8.5-Q OUT | 13.27 P LOSS | 34.11 Q LOSS | | |
| 038-002-00 BELL | COU 2 | 235.6- | 23.8 | 241.1- | 21.6- | 7.50 | 45.36 | | |
| 038-031-00 BELL | CAB G | 2.1- | 33.2- | 2.1- | 10.9- | .06 | 22.38- | | |
| 038-037-00 | 250 BELL | 85.2 | .1 | 84.9 | 3.4- | .29 | 3.53 | | |
| 038-042-00 BELL | BEACO | 124.6 | 71.8- | 124.4 | 71.8- | .28 | .13 | | |
| 038 | | .0 P G | .0 Q G | 399.2 P L | 219.1 Q L | 65.0 Q COND | 98.7 Q CAP | | |
| 038 | CASE 01 | 399.2-P NET | 55.2-Q NET | | | | | | |

**Above, the usual tabulation of results is cumbersome and difficult for engineers to evaluate. Translating this data to a system diagram was a time consuming process. Below is the same information on an easy-to-read one-line diagram, the result of a few minutes processing in the IBM 407. Machine translation saves time, avoids human error**




Bonneville Power Administration engineers have programmed a computer to print the results of a complicated load flow study on a specially prepared one-line diagram. With an impressive record of firsts in the application of digital computers to load flow studies, this recent improvement places the information that was normally tabulated on a ream of paper automatically on a specially prepared form where engineers can rapidly evaluate the results of the study. This saves the engineering time formerly used in hand transcribing the information from the tabulation to a system diagram. Information available is:

1. Voltage at every bus.
2. The real and reactive power flows and losses in every line and transformer.
3. The reactive that must be supplied at every bus under voltage control.
4. The loading of all condensers and capacitors.
5. A detailed breakdown of load and generation at every bus.
6. The total system losses.
7. A summary of total generation and load.

### Speeds Program

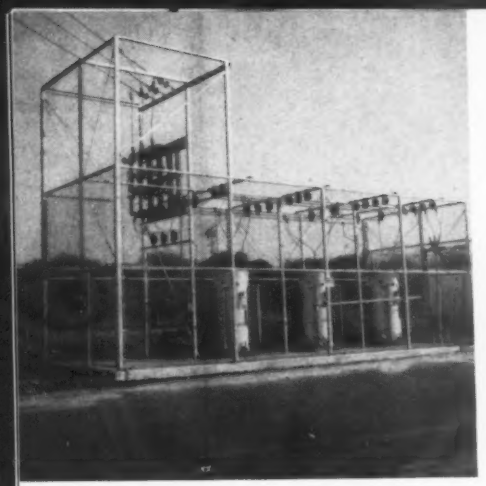
A second time-saving program is one which automatically combines the system parameters with the bus numbering system necessary for the problem solution, as well as the load data which is furnished by the load estimating group. An IBM 650 program converts this mass of data directly into bus cards, which form the load flow input data deck.

This input deck can then be processed in *three to five hours* on the same IBM 650 machine, or in *three to five minutes* on the higher-powered 704.

Making further use of the optimum power of the computers, Bonneville engineers have prepared IBM 650 programs that enable them to make minor changes to a basic solution without submitting the main equation deck to the thousands of iterative solutions required to solve the complete problem.

### Automatic Analysis

In some studies it is necessary to compare the results of a series of incremental changes. Here, the best solution would require the analysis of cumbersome masses of data. Here again, the intrepid programmers have used the machinery to analyze the results by various criteria.



Neat appearance, rapid construction and use of enclosure members for equipment support highlight design of customer substations

**Increasing construction costs cause Edison to standardize . . .**

# Customer Substations—Save 18%

**J. H. Scott**
Distribution Engineer
Southern California Edison Co.
Los Angeles

Each year, Southern California Edison Co. builds 100 customer substations from 500 to 3,000 kva, primary voltage 12 or 16 kv.

An engineering study of hundreds of these substations indicated that three basic designs would be satisfactory for 75% of the substations in this range.

Edison requires a customer to furnish a concrete slab to its dimensions and specifications. Upon this pad, the company erects a screened transformer enclosure and connects to the customer's service facilities.

The standardized enclosure sizes are 12 x 20 ft for three-phase transformer installations 500 to 3,000 kva. Single-phase enclosures are 12 x 18 ft for the range from 500 to 1,500 kva, and 12 x 32 ft from 1,500 to 3,750 kva.

Protection for the transformer bank is accomplished by a rack-type load interrupter switch and boric acid fuse combination mounted on the structure as a unit.

In addition to standardizing the substation's sizes, the enclosure and equipment supports were integrated and standardized to use material in exacting quantities.

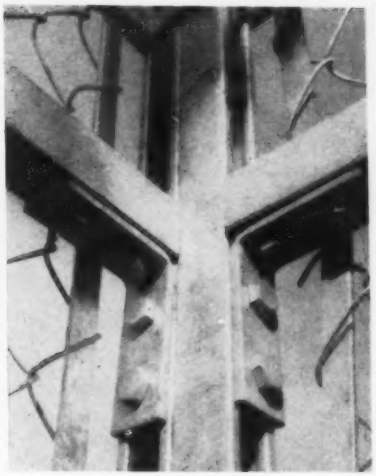
Formerly, the material used for structural members was galvanized 2-in. pipe bolted together with pipe-rack fittings, which have been in common use throughout the industry for a number of years. Using pipe entailed cutting each pipe to length, capping the ends and assembling to other members, using pipe clamps. This method proved to be satisfactory, but rapidly increasing construction costs made it desirable to review new construction methods.

The material selected was galvanized 1⅝-in.-square channel, 12 gage, with one side slotted for attachment to other members. This material has become fairly common for adjustable shelving racks and, in spite of the new application to substation structures, only a minimum number of unorthodox parts were required. All vertical columns are fabricated into double sections by spot welding single sections back to back prior to galvanizing. Base plates with precut holes are also welded to each column for anchoring the structure to the pad. All structural members are cut to length and numbered by the supplier. The nuts for attaching fittings are unique in their design in that they each lock into place within the channel by a spring compressing against the side of the channel. Torque transmitted by the bolt also helps lock the nut in place.

Assembly is very fast and simple using prescribed fittings, nuts and bolts. Each of the enclosure sides

**Cost Comparison for Pipe-rack and Precut Channel Enclosure**

| | 2-in. Pipe Structure | | New Channel Structure | | Per Cent Difference |
|---|---|---|---|---|---|
| 12 x 18 ft enc. | | | | | |
| Material | | $ 478.00 | | $536.00 | |
| Labor | 83 man-hours | 249.00 | 30 m-h | 90.00 | |
| Total | | $ 727.00 | | $626.00 | 14% |
| 12 x 20 ft enc. | | | | | |
| Material | | $ 666.00 | | $705.00 | |
| Labor | 111 m-h | 333.00 | 36 m-h | 108.00 | |
| Total | | $ 999.00 | | $813.00 | 18.6% |
| 12 x 32 ft enc. | | | | | |
| Material | | $ 763.00 | | $833.00 | |
| Labor | 130 m-h | 390.00 | 43 m-h | 129.00 | |
| Total | | $1,153.00 | | $962.00 | 12.5% |



Close-up of square channel construction

### Steps in the Design of Standardized Substations

1. Choose the least number of designs necessary to cover the majority of substations.
2. Make sure the selected designs are as flexible as possible.
3. Analyze new types of material, weighing such factors as economy, availability and the manufacturer's willingness to co-operate in an experimental program.
4. Build several structures. Better comparison is obtained if several structures of different designs and materials can be built simultaneously.

may be fabricated on the ground, giving the entire crew the benefit of working on the project at one time. When the two long sides have been fabricated, they may be "tipped up" manually or mechanically, moved to the concrete slab, and set in place. Additional members may then be added to complete the structure. Adjustable ¼-in. guy wire diagonal braces are added corner to corner on each side to provide more rigidity.

Material control and design standardization go hand in hand with one another. Once the designs are chosen, detailed material lists may be prepared for each transformer capacity and service voltage. A standardized material list with too many variables is undesirable, unless the variables can be clearly understood by material control personnel. This is very important because material shortages (because of the number of variables) usually go undetected until actual construction. Countless man-hours can be saved by double checking material prior to construction.

# Wire and Cable

## Insulating and Nonmetallic Jacketing Material

## Characteristics Check List

F. B. Schullerts

Selection of a cable insulating material is a problem of matching the requirements of a specific installation with the properties of available insulations and jacketing material. This check list has been compiled to call to mind properties which may or may not be important. Careful evaluation of the important characteristics for a particular application should result in more reliable cable installations. Additions may be made to the list by the individual to suit his special needs.

### Physical Properties

1. Tensile strength
2. Tensile strength (after oxygen bomb test)
3. Tensile strength (after air oven tests)
4. Elongation
5. Elongation (after oxygen bomb test)
6. Elongation (after air oven test)
7. Recovery
8. Modulus of elasticity
9. Specific gravity
10. Compressive strength
11. Impact strength
12. Set
13. Brittleness
14. Hardness
15. Vulcanizing properties
16. Tear strength

### Electrical Properties

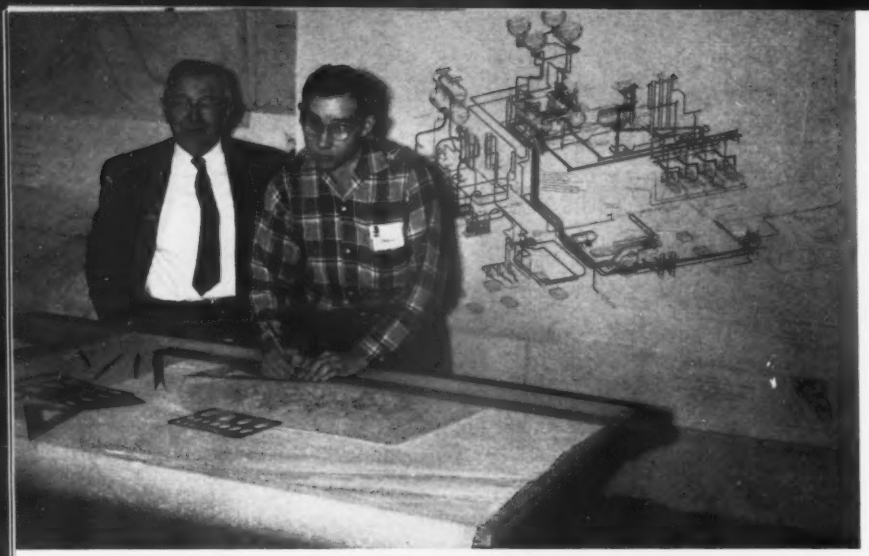
1. Dielectric strength, initial a-c
2. Dielectric strength (d-c)
3. Dielectric strength (after aging)
4. Dielectric strength (after water absorption)
5. Dielectric strength (under physical stress)
6. Dielectric strength (under elevated temperatures)
7. Dielectric loss
8. Specific inductive capacity
9. Power factor
10. Insulation resistance
11. Electrical stability

### Resistance to

1. Acid
2. Alkali
3. Oil and grease
4. Gasoline, alcohol
5. Chemical fumes
6. Moisture absorption
7. Moisture or gas penetration
8. Flammability (supports combustion)
9. Flammability (does not support combustion)
10. Sunlight (ultraviolet rays)
11. Weather (other than sunlight)
12. Bending or flexing
13. Cold flow
14. Cracking
15. Heat (softening, deterioration, etc.)
16. Cold (affecting brittleness, etc.)
17. Oxidation
18. Chemical instability
19. Fungi, termites, rodents, etc.
20. Microbiological deterioration
21. Radioactive substances
22. Chemical osmosis
23. Direct current osmosis
24. Ozone
25. Corona
26. Ionization

### Miscellaneous Considerations

1. Freedom from toxic or irritating properties that might cause concern to personnel
2. Smoothness of outer surface that might affect pulling friction
3. Other characteristics of outer surface that might affect pulling friction
4. Ability of manufacturer to meet specified thickness
5. Eccentricity of insulation or jacket
6. Freedom of outer cable surface to externally applied materials that might affect pulling friction or pick up foreign materials that might be carried into a duct or conduit
7. Thermal conductivity



**Dan McQuaid, who developed the system of three-dimensional, scalable projections, with his youngest employee, 19-year-old Jerry Hill. Jerry, as a junior draftsman, completed the three-dimensional projection of the pulverized coal and natural gas piping system for No. 3 boiler of the Zuni steam-electric station of Public Service Co. of Colorado shown in the background**

## Erection, training and maintenance simplified by the use of

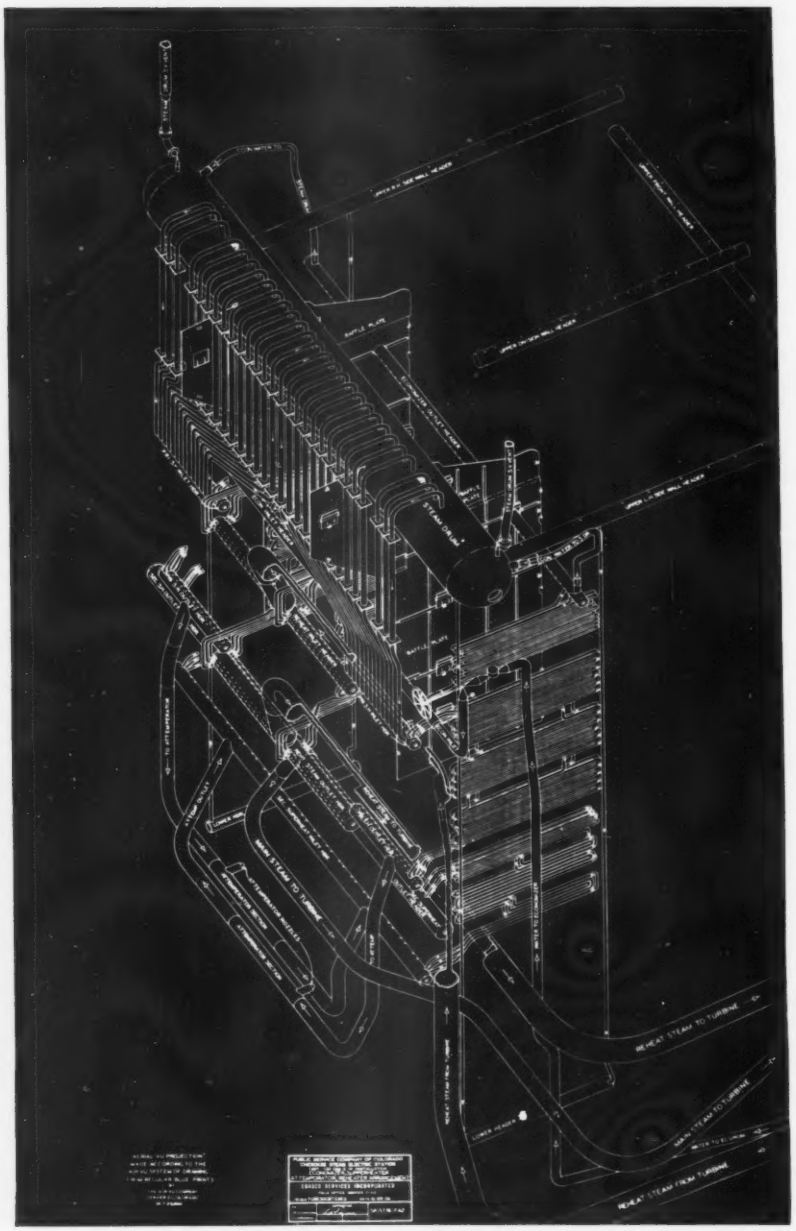
# Scalable,

Mechanically correct, three-dimensional engineering and architectural projections are possible under a drafting system developed by a Denver engineering concern. Basically the system makes possible the production of axonometric drawings with simple drafting tools, scaling the three-dimensional drawing from standard blueprint plans, cross sections and elevations. The resulting drawing is not only scalable but is free from the distorted appearance that normally is present with regular isometric or commercial perspectives.

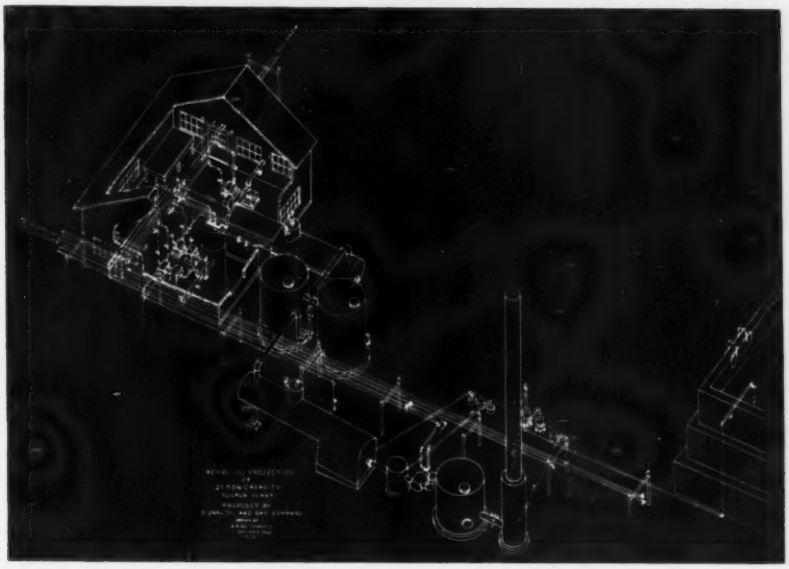
Drawings of this type do not require special drafting skills as the angular relationships involved are created through the use of special triangles and proportional dividers, which convert the dimensions in regular plan and elevation drawings to proportional lengths in the planes of parallel projections from which emerges the three-dimensional view. Samples of various types of drawings are shown.

### Wide Application

Because the system provides scalable, distortion-free perspectives,




**A three-dimensional view of the economizer, superheater, reheat piping and steam drum arrangement in a modern steam generator drawn from regular blueprints. The advantage of having such a drawing is that field crews can see relationship of parts**



View of the piping arrangement for a proposed sulphur plant, showing the location of both piping and equipment and the effect of the cutaway building to help engineers visualize appearance of the interior

# 3-Dimensional Drawings

drawings of this type are particularly useful in erection operations. Also the fact that cutaway or sectional views are easily worked out makes drawings of this type particularly timesaving in the assembly of complicated structures such as boiler tubing, piping and similar equipment. The combination of the regular plan and elevation drawings with the scalable, three-dimensional view has proved particularly helpful to field crews.

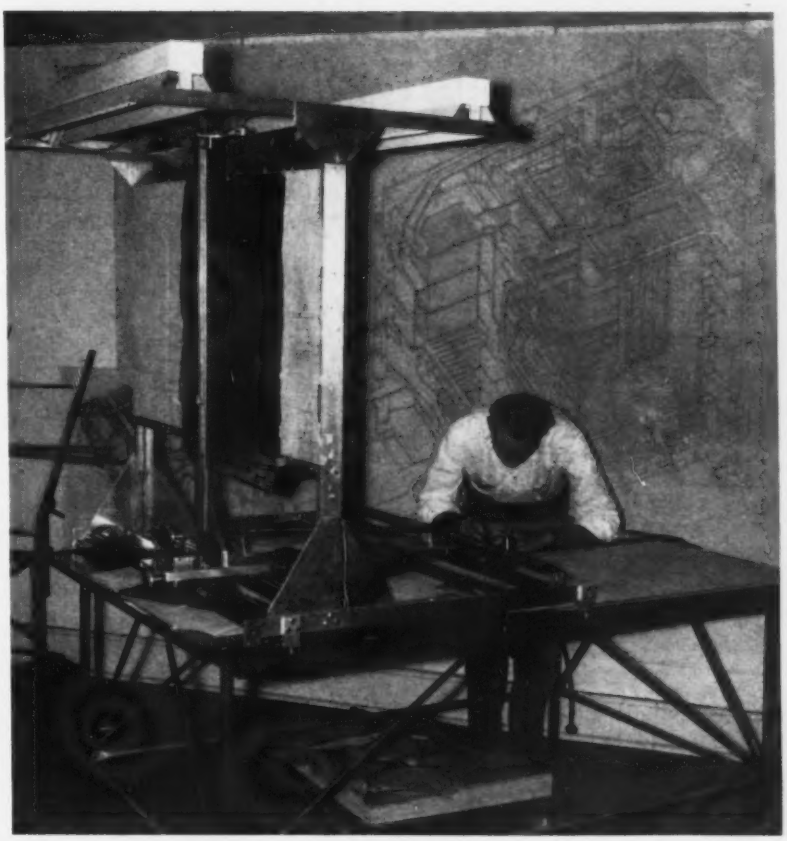
In another area, the three-dimensional projections of power circuits, conduits or piping arrangements has proved to be an excellent tool in training new operators in station operation. Likewise, this type of drawing is invaluable when engineers are called on to make alterations or additions sometime in the future.

### May Replace Costly Models

Still another application is the use of the three-dimensional drawing to enable nontechnical executives to visualize the appearance of new facilities that may be under construction. Often they can replace models for either visualizing the appearance of a completed installation or for checking the location of piping, valves, pumps, instruments and other equipment both for practicality in construction and for convenience of the operators in the future. Drawings of this type can be produced at a fraction of the cost of a physical model of a complicated industrial installation or power station.

### Air-Vu Drawing Machine

The drawing system is the development of Daniel J. McQuaid, longtime member of the engineering fraternity in the Rocky Mountain area, who has named it "the Air-Vu system of drawing because the objects are drawn as if being viewed from infinity." In addition to the special drafting implements he has developed for the system, he has also designed a projection drawing machine. This device quickly and automatically sets out centers and center lines in the correct three-dimensional projection by means of an arm that operates in conjunction with indices set on the proper points of plan and elevation drawings.



A. D. Rounds works on the projection drawing machine, which translates the same point on plan and elevation blueprints into a center point on the three-dimensional projection

Each of the coils (right) contains enough metal to make 70,000 standard-size food cans. Metal travels at 600 ft per minute

**Shear line controls pack . . .**

# Big Service in Small Packages

As the complexity of electric controls required for the machines and processes of industry has increased, outside physical appearance has become more and more simple, taking the form generally of just one or more plain steel cabinets. Operators of plants and factories like the idea of having the manufacturer combine the necessary components into simple cabinets that are easy to install, save space and increase safety.

Adjustable speed direct current drives are included in this packaged type of construction—just a plain steel box with a few louvers, push buttons and a dial or two. The inside, however, is a busy place, including motor, generator, exciter, starter, rheostats and generally some electronic tubes. The package even includes its own ventilating system with fan and air filter to insure clean operating conditions for the equipment within.

A drive of this kind may perform a very simple task such as powering a gluing machine in which short length of boards are end glued to form marketable lengths. In this type of installation the operator turns a small knob when he wants the speed to be higher or lower. The "box" responds faithfully over the wide range of speed needed to meet the variety of gluing conditions under which the machine operates.

These packaged adjustable speed drives are built in capacities from 1 hp to 500 hp. They are used on individual machines such as described above, on machine tools, crane hoists, log carriage drives, rotary screens and filters, and integrated into complex systems. They are used wherever stable highly flexible speed control is needed over a wide range of operation.

Machines in American Can Co.'s new coil processing plant at Oakland are a good example of integration of packaged adjustable speed drives into a system. In this new facility steel coils, each containing approximately 16,000 lin ft of tinplate and weighing as much as 15,000 lb, unwind continuously and at speeds up to 600 ft a minute into machines that shear the strip into precisely dimensioned sheets from which cans are fabricated. The combination of machines that perform this function are called shear lines. There are five in the plant, three having been supplied by the Wean Equipment Co. and two by the Littell Machine Co.

The basic elements of the Wean lines are pay-off reel, leveler, inspection, flying shear and classifier. The moving tinplate encounters these operations in the order named. The operation of the leveler and classifier must be closely coordinated with that of the shear. This is where the automatic controls come in. They must not only coordinate but also provide operation over a considerable range of speed from practically creeping to 600 ft a minute, preserving coordination at all times.

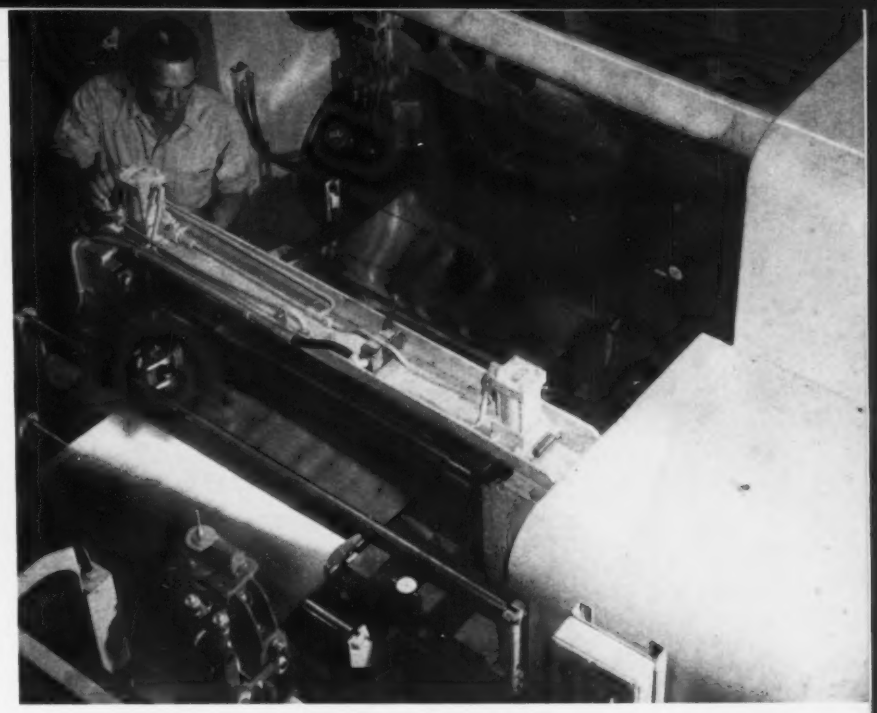
The basic elements of the controls and drives are General Electric packaged Speed Variators, which provide the wide stable speed range inherent in armature voltage control of d-c motors. The stopping, starting speed change, manual reject and other adjustments are made from a control console.

The speed of the leveler (this machine corrects the tendency of the freshly uncoiled strip not to lay flat) is properly related to shear speed by

means of photoelectric loop control. Four photoelectric relays, mounted one above the other, view the loop that is maintained between the leveler and the shear. Normal regulation is accomplished by the middle pair of relays. If the loop becomes too long it intercepts the light beam of the lower relay of this pair. Resulting action of the relay decreases the voltage applied to the armature of the leveler motor, its speed decreases a bit and the loop shortens. Should the loop become so short as to no longer intercept the light beam of the upper relay of the middle pair, this relay increases voltage and the motor speeds up. The outer pair of relays provide shutdown in case the loop should become excessively long or unsafely short.

The speed of the classifier is coordinated with that of the shear by means of a speed matching regulator which operates the classifier at about 10% above shear speed so there will be some space on the conveyor belts between sheets. Comprising a system of six conveyors, the classifier stacks the sheets or scrolls into one or the other of three piles. The first pile receives any material that has been rejected due to pin holes or out of tolerance thickness. The other two are prime piles. When a prime pile receives a specified number of sheets, counted by a photoelectric relay, the classifier automatically shifts its discharge to the other prime pile. Another photoelectric relay causes the receiving pallet to lower periodically as sheets build up on the pile so that the pile is always at proper height with respect to the conveyor.

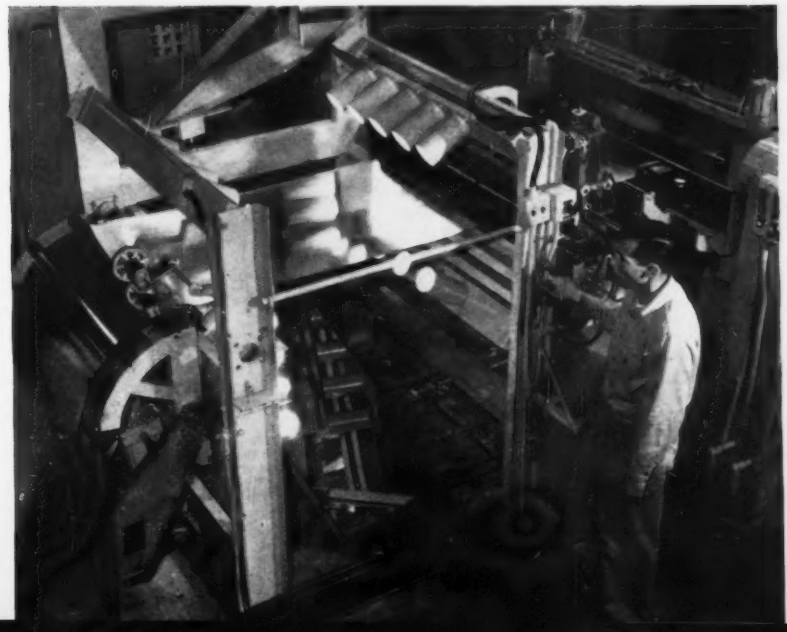
Pin holes are detected by means of a General Electric pin hole detector. Photoelectric tubes beneath the sheet actuate a rejection device whenever the illumination level changes because of light penetrating the sheet from the light box above. Even with the sheets traveling at 600 ft a minute, pin holes 1/1,000th of an inch in diameter are detected. An ingenious timing device "remembers" the defect. Be it a pin hole or out of tolerance thickness, the plate or plates containing the defects are diverted to the reject pile immediately after shearing. Both pin hole detector and thickness gage are located ahead of the shear. The operator at the control console can, by pushing a button, similarly divert any sheet on which he has detected a surface defect through visual observation.



**This is where the strip of metal is cut into sheets at the rate of 200 cuts a minute**

The Littell lines perform a similar function. The operation is a little different mechanically. Perhaps the principal difference is the fact that the strip stops mechanically during shearing, with the loop receiving the traveling strip during that period. Two d-c generators supply adjustable voltage direct current, one to the shearing motor and the other to the straightener (leveler) and pay-off motor. A series booster generator is included in connection with the pay-off reel, and a separate exciter supplies the various motor fields. The length of loop is controlled by photoelectric relays which raise or lower straightener speed to keep the loop at proper length. As in the case of the Wean lines, direct current generating and control equipment are General Electric packaged Speed Variator type.

Never judge the IQ of a steel box by the plainness of its cover. More and more intelligence, and muscle too, are crowded into them to the advantage of the user and to the hastening of the day when automation will be widespread.



**Steel moving at 600 ft a minute is scanned electronically and visually at the same time for imperfections, thickness and uniformity of surface. Mirrors above and below the metal aid the attendant. Holes are spotted by light passing through the sheet that is sensed by General Electric photoelectric tubes underneath. The tubes then actuate a rejection device that tracks the sheet to the end and stacks it separately**

**Eliminate costly down-time by . . .**

# Preventive Maintenance

**John V. Branscome,** E. I. du Pont de Nemours & Co., Antioch, Calif.

The du Pont Antioch Works has been built for the manufacture of "Freon" and tetraethyl lead. Construction of the plant began in 1955 and was completed in 1956. It is located in Antioch, Contra Costa County, Calif., on the south bank of the San Joaquin River. Open-type construction has been used for the manufacturing buildings with all process operations monitored and controlled from their respective air-conditioned control rooms. Both of the operations are of the continuous-process type. Motors, valves and other equipment are operated automatically or by push button from graphic panels.

For an operation of this type, it is necessary that all equipment be maintained in an excellent operating condition. Otherwise, excessive downtime and loss of production will result. This article will discuss a preventive maintenance program that is in operation at the Antioch Works to keep the electrical equipment and controls in peak performance for a continuous operation.

## Planning

The plans for the preventive maintenance program were begun during the early construction of the plant. A master schedule for all electrical work was prepared for a five-year period. Frequencies of preventive maintenance inspections were based on past experience at other du Pont plants. However, they are flexible and have been changed in some instances to conform with demands at this location. Major equipment, such as motors, transformers and starters, are covered on a six-month basis. A maintenance schedule was put into effect at start-up and has proved most satisfactory.

## Procedures

Procedures have been an excellent answer to a maintenance engineer's problem of education and training of an unskilled mechanic. They were prepared during the early construction stage and have remained in constant use. Some of the more detailed ones have been tabulated in a check-list form. Fig. 1 shows a check list for an inspection of a motor and associated controls. The same sheets are used for repetitive inspections and gives the maintenance engineer the over-all history of the equipment.

The high-voltage distribution system, substations and low-voltage feeders are the life line of any industry. To keep this equipment in peak performance, a "Doble" and high-voltage test was made upon completion of construction and again in 1957. These tests determine the qualities of the conductor insula-

Page 1 of ___

E. P. NO. _____

PREVENTIVE - MAINTENANCE CHECK LIST

E. P. NO. _____ MOTOR AND CONTROLS

PROCEDURE:
A. CHECK IN WITH OPERATIONS FOR PERMISSION TO SHUT DOWN EQUIPMENT.
B. HAVE OPERATIONS TURN SAFETY SWITCH OFF BEFORE WORKING ON EQUIPMENT.

SAFETY:
A. TEST ALL TERMINALS IN STARTER WITH VOLTAGE TESTER BEFORE WORKING IN STARTER.
B. SWITCH MUST BE "OFF" BEFORE WORKING IN STARTER.
C. BEFORE WORKING ON PUSH BUTTON AND MOTOR, FUSES MUST BE PULLED AND SWITCH LOCKED "OFF" WITH PERSONAL LOCK.
D. REMEMBER - NO WORK ON ENERGIZED COMPONENTS.

| | DATE | DATE | DATE |
|---|---|---|---|
| I. COMBINATION STARTER | | | |
| A. CLEAN STARTER | | | |
| B. SWITCH | | | |
| 1. IS B-$\phi$ CENTER & GROUNDED | | | |
| 2. BLADES | | | |
| a. CLEAN | | | |
| b. PITTED | | | |
| c. BROKEN | | | |
| d. ARC CHUTES | | | |
| C. FUSES | | | |
| 1. TYPE | | | |
| 2. SIZE | | | |
| 3. CLIPS | | | |
| a. SIZE | | | |
| b. TIGHT | | | |
| c. CLEAN | | | |
| d. TENSION | | | |
| e. TIGHT TERMINALS | | | |
| D. CONTACTOR | | | |
| 1. SIZE | | | |
| 2. CONTACTS | | | |
| a. CLEAN | | | |
| b. DIRTY | | | |
| c. CLEANED | | | |
| d. REPLACED | | | |
| e. ARC CHUTES | | | |
| f. ALIGNMENT | | | |
| 3. COIL | | | |
| a. COIL NUMBER | | | |
| b. CLEAN | | | |
| c. INSULATION (CONDITION) | | | |
| d. WINDING RESISTANCE | | | |
| 4. OVERLOADS | | | |
| a. SIZE | | | |
| b. TRIP SETTING % | | | |
| c. TESTED FOR TRIP | | | |
| 5. TERMINALS (TIGHTNESS) | | | |
| a. LINE | | | |
| b. LOAD | | | |
| c. INTERLOCKS | | | |
| d. OVERLOADS | | | |
| e. TRANSFORMER | | | |
| f. CONTROL CIRCUITS | | | |

**Fig. 1. Complete maintenance and repair record on each motor is recorded on this form and filed for future reference. It is used with a maintenance schedule form**

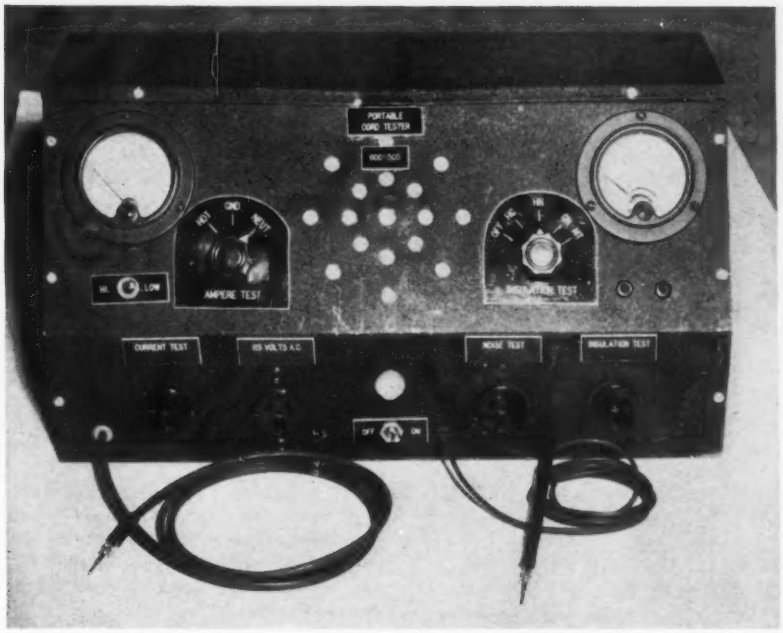



**Fig. 2. Tester designed to expedite inspection of portable equipment. It has a 450-v d-c supply to measure insulation, a 15- to 30-amp circuit to check conductor capacity and a noise amplifier to detect and locate loose connections in circuits**

tion and transformer oil. A repeat test has been scheduled three years later. Such tests are quite expensive and may require 10 to 15 years before the procedure may pay off.

The ultimate success or failure of this program depends upon the skill developed in the mechanic that makes the inspection, the quality of the equipment and an effective application of the schedules. Thus far it has paid dividends. Loose connections, defective insulation on feeder conductors, presence of moisture in motor junction boxes and contaminated oil are some of the conditions corrected before equipment failures occurred.

### Portable Equipment

Since portable equipment is handled in an energized condition, it is mandatory that it be maintained in a safe operating condition. In general, shop and hand tools are inspected on a monthly basis. These tools include such items as electric drills, grinders, impact wrenches, extension lamps, portable pumps, etc. At the end of each month, a list of the equipment, who made the inspections and conditions found is issued to responsible supervision. Office and laboratory equipment receive a less severe application and, therefore, are inspected on a six-month basis. A band of colored tape is attached to the cord of each item to indicate the month of last inspection. Safety instructions on the use of portable equipment specifically state that no item is to be used unless it bears the proper inspection marker.

It is not difficult to imagine that the number of units requiring an inspection would run into the hundreds. To expedite the test work, a portable tester has been designed and built by du Pont personnel to give a continuity and insulation test.

The portable equipment is plugged into the tester. By the manipulation of selector switches and indicating meters, the continuity of cord conductors and insulation resistance is indicated. A current of 15 to 30 amp, depending upon cord length, is put through each conductor on extension cords and lamps. The same test is made through the ground conductor and frame of all portable equipment. This procedure not only proves the continuity of the ground conductor but its ability to carry sufficient ground current to trip overload protective devices.

A regulated d-c potential of 450 v is applied to determine the condition of insulation. This potential is applied between cord conductors, two at a time, and between internal insulation and ground. A selector switch and meter make this test possible in a matter of seconds. A photograph of the tester is shown in Fig. 2.

**Fig. 3. A receptacle polarity tester composed of three 110-v pilot lamps that light to indicate whether hot, neutral and conductor terminals are connected properly**

### Receptacles

In conjunction with test work on portable equipment, it is necessary that 110-v receptacles are wired properly. Fig. 3 shows a small tester that uses three 110-v pilot lamps to determine if the hot, neutral and ground connections are polarized properly. Miniature voltmeters that will indicate line voltage may be substituted for the pilot lamps.

### Safety

While safety is discussed in the latter part of this article, it is, however, the most important. To emphasize this point, there are two safety slogans that are very popular among our company personnel. They are: "Take a Second to Put Safety First" and "Safety Is the Most Important Job We Have to Do." To convince the individual that his safety is of the utmost importance, safety rules, regulations and procedures are written to cover each job. Each mechanic is educated and re-educated in these basic safety principles that must govern his work habits. In addition to the above training, he is required to use certain test equipment and protective clothing. Each mechanic is encouraged to wear safety shoes while on the job. He is issued and required to wear a safety hat, safety glasses, protective gloves, flame treated work clothing and an individual voltage tester for use on circuits operating at 600 v or less.

No work, except the use of a voltmeter or clamp-on ammeter, is permitted on or adjacent to energized conductors or equipment. Gloves are

to be worn when using a voltmeter on circuits operating at 110 v and above. It is realized that with adequate test equipment, voltage readings on circuits up to 600 v may be taken safely without the use of gloves. However, an accidental move or slip may prove injurious or even fatal. Why take a chance on life if a pair of gloves will eliminate the possibility of an electrical shock? For locations that have not adopted a "no-hot-work procedure," the task seems almost impossible. However, after experience and with planning and scheduling, the method becomes reasonably simple.

To assure everyone that this safety program is not a one-time affair, weekly safety meetings are held with each group of mechanics. Safety hazards, any unusual incident and safety procedures are discussed. Safety suggestions, without financial reward, are encouraged and received. As an example, during a recent campaign in safety slogans, a mechanic skilled in electrical work took first place with his slogan — "Stocks In Safety Pay Dividends in Life."

The less safety conscious individual will wonder why such great effort is stressed on employee safety. The answer is that this company wants the employee to have a safe place to work. This objective has been accomplished and proved by the 1956 injury statistics. For every one-million on-the-job exposure hours, there were 6.38 time-losing injuries for industry as a whole. The frequency rate was 3.38 for the chemical industry and 0.43 for all du Pont plants. For the Antioch Works this frequency rate is zero for the two years of existence.

### Summary

For a continuous process operation of this type, it is necessary to develop and put into effect a program that will keep the equipment in top operating condition. To minimize production downtime, it must be coordinated with other maintenance work. However, no program can be considered adequate or successful unless it can be accomplished with a high degree of safety for all personnel. It is, therefore, necessary to incorporate safety steps in maintenance procedures. Since portable electric tools can offer a great hazard to the maintenance mechanic, it is necessary to maintain them in a safe operating condition by periodic inspections. The present preventive maintenance and safety program has provided the desired results at the Antioch Works.

**Modern, low structures provide an area for studying the economics of feeder design. At Spokane's new Shadle Park High school, the answer was . . .**

# Aluminum Feeders

PLANNERS, architects and contractors involved in erection of public school buildings are traditionally a cost-conscious lot, and for good reason. The taxpayer who foots the bill for school structures wants the best facilities for his children, with the least possible burden to his pocketbook. Any new building product or technique that reduces cost wins friends and influences people.

Careful engineering on one school installation indicated that a combination of aluminum and copper conductors would effect appreciable economies. At the beautiful new Shadle Park High School, opened last fall in Spokane, Briggs Electric Co. was the sponsoring electrical contractor in a joint venture with Kehne Electric Co. The installation presented a rather unusual opportunity for an economic study in the use of aluminum and copper conductors. Paul L. Briggs, owner of the company, explained the basis of the company's choices and the results noted as the job progressed at a September IAEI meeting in Spokane.

Shadle Park High School is a long and relatively low rectangular structure, two blocks long and approximately one block wide and three stories high in the center wing. The building has an extensive and entirely modern 480/277-v electrical system designed by Joe Doyle, Spokane consulting electrical engineer. Lighting is at 277 v. Twenty-one dry-type transformers ranging from 3 kva to 350 kva were installed.

When materials were being ordered for this project in the spring of 1956, copper was 40c per pound. The feeder schedule provided by the consulting engineer in the plans set forth for each feeder the necssary wire and conduit size for both copper and aluminum conductors. An analysis of the job, feeder by feeder, permitted a selection of runs for which it appeared aluminum conductors offered cost advantages. This was somewhat unusual as the contractor seldom is given the opportunity to make such a choice. Usually when aluminum conductors have been used they have been specified for particular reasons, including in some cases the desire of the owner to promote the use of aluminum.

The economic study indicated that it would be desirable to use aluminum in 350-, 500- and 750-mcm sizes for long runs. Consideration was given to the larger size conduits required and the additional labor involved in installing conduit and making terminal connections with the larger sized aluminum conductors. The contractor could only guess, of course, what the labor factor might be in pulling the aluminum cable in the long runs.

Some of the feeder runs were as long as a city block. Although pull boxes had been installed in some of the longer runs, it was found that they were unnecessary. Apparently the reduced weight of the aluminum more than made up for the larger size because cable pulling proved to be a comparatively easy job and it was possible to operate the cable puller at high speed.

Copper was used for branch circuits and short runs, both because short lengths were already available in the contractor's stock and because the additional expense of materials and labor for making terminal connections with aluminum conductor would not be offset by savings in wire costs or short lengths.

The use of aluminum did require some preplanning and on-the-job innovations by the electrical crews. Before the materials were ordered, drawings of the transformer manu-

# Show Saving

facturer, panelboard manufacturer and dimmer manufacturer had been carefully checked to make sure that all apparatus came equipped with Thomas & Betts' aluminum lugs for bus pads. This was necessary because it was planned to use a T&B compression tool to fasten lugs to conductors and the relatively high cost of these tools required use of the brand for which a tool was available. This precaution satisfactorily solved the problems of making connections to bus pads, although, of course, additional labor was required to make terminal connections because of the necessity to clean the wire thoroughly and use antioxidation compound prior to application of the lug.

The fact that panels were designed for use with copper conductors and did not provide the additional space necessary for aluminum conductors also presented some problems. In one panel it was necessary to run aluminum feeders from molded breakers. As the photograph indicates, the panel did not have sufficient room to bend the aluminum cable at right angles to permit flat connection of the aluminum to the copper terminal. This problem was effectively solved by improvising shaped pieces of copper bus to extend horizontally from the breaker terminals to permit flat vertical connection of the aluminum to the extensions without the necessity of bending the aluminum conductor.

The 7,875 ft of aluminum conductor for the project were supplied by Kaiser Aluminum & Chemical Sales Inc., and represent a saving of between $5,000 and $6,000 as compared to an equal footage of copper cable at the then current copper prices.

Total cost for electrical work in the building was more than $217,000, over-all cost about $3,500,000.

**Above—T & B compression tools were used in making connections for the aluminum feeders. Care was taken to prepare the wire properly before applying the lugs**

**Below—Lack of space at the bottom of some panels (designed for copper circuits) required the use of improvised L-shaped copper pieces, which enabled flat vertical connections without bending conductor. In some cases a side connection was found necessary**

**Grounding Transformers—III**

# Zigzag Grounding Transformers

**Tom Hughes**
Electrical Safety Engineer
California Division of Industrial Safety

In the not-too-distant past, utility companies used more different transformer and balance coil setups than anyone could catalog. Not only was there no standardization in transformation and line correction practices but no two groups of experts used the same names for their pet hookups.

It was common practice to use autotransformers on the end of a three-wire single-phase line to counteract the effect of customer loading unbalance. Three-phase autotransformers were used in the same way at the end of four-wire three-phase systems. These were known in some circles as balance coils, thus confusing our terminology (where balance coils of generator setups might be assumed).

It soon became apparent that a simple autotransformer (across the line) has a rough time of it when a fault occurs on the line; so designers started building them with delta stabilizing windings, similar to that of Fig. 2. Utility engineers saw that they could use an ordinary three-phase two-winding transformer to do the same thing.

Then some bright engineer got the idea of improving the stabilizing effect by connecting the divided windings of the secondaries of three single-phase transformers in the rotation shown in Fig. 4. The primaries are not shown in Fig. 4 because we don't want to confuse the picture but they were just connected in series to form a closed delta (circulating path) as shown in Fig. 2.*

By later study and tests on this setup, it was learned that when the secondary windings were connected in such an arrangement (dubbed zigzag) and used as the primary of a stabilizing transformer, the remaining windings (which had been coupled in a closed delta) were not needed. During ordinary balanced loading of a three-phase system, this "primary" hookup (used as a balance coil or stabilizing ballast on the end of the system) just floated on the line and drew a little charging current.

There was no flow of normal current from any phase to neutral (or to ground, if no neutral were carried along the line). However, when any unbalance or fault current started to flow, the contraphase winding (on the same core leg) would force the by-passed phase to assume a share of the load.

Proper control of line loading balance and power factor by utilities has outmoded the balance coil or stabilizing transformer but it found a new use as a line grounding transformer or means of obtaining a neutral. From this use it was drafted by the industrial engineers for use as a grounding transformer on a system in a plant fed from a delta secondary. And finally, it has been converted to use on 277-v lighting systems.

### To Clarify

Now, our purpose in going through all this genealogy is to straighten out the nomenclature. Notice that the original need was filled by an *autotransformer* which became known as a *balance coil* in some circles and *stabilizer* in others. As it was refined by steps to its present state, it was still thought of by utility men as an *autotransformer*.

In its present package it is called by transformer designers a *"wye-zigzag"* and, by industrial engineers, just a *"zigzag"* or grounding transformer. Now that the utilities have learned the troubles its misapplication can cause for them and their customers they wish to discourage its use. So, we find it being branded in many circles as an autotransformer and everybody knows that an autotransformer is not permitted for transformation in interior wiring systems.

In Fig. 5, we have a trigonometric representation of the three legs and six coils of a wye-zigzag transformer. Phase disposition of 120° apart is represented by the dashed (dotted) lines, A, B and C. Each one represents the iron-core leg of a three-phase transformer. The connections between the six windings (coils) are the same as those shown in Fig. 4 but the designation by letters has been changed.

In Fig. 4, the three legs are three separate single-phase transformers and the lettering was chosen to keep in mind the coils on the same core. However, in Fig. 5, we are concerned primarily with the effects of mmf (magnetomotive force) generated in the three core legs of a three-phase transformer. Thus, in Fig. 5, the letters $a_1$ and $a_2$ are chosen to show us that the emf (electromotive force) received from each phase wire of the line is split and used to oppose that of an alternate phase on the next core leg.

Trigonometrically, we see that the mmf induced by the coils $a_2$ and $b_1$ on core leg B are displaced 30° from normal phase sequence of that core leg. At the same time, we see that their mmf are displaced 120° from each other. In other words, they are just exactly one phase away from each other, in the 360° phase disposition of emf. Therefore (under steady-state, balanced-load conditions) no transformation can take place.

Now, in an autotransformer, the same mmf flows through the whole core leg (for any phase disposition) and the whole purpose of its use is to produce transformation from an imposed emf to a utilized emf at a differing potential, within the same winding. Since the ratio of voltages is proportionate to the ratio of included turns within the same coil, the voltage ratio can be considerably altered by a shorting of turns (from insulation failure) and consequent displacement of the center tap.

We fail to see any comparison between the wye-zigzag transformer and the autotransformer and (as we pointed out earlier) the zigzag disposition of windings developed from the fact that an autotransformer couldn't stand a zero sequence flow of current. But, how does the zigzag transformer work?

The functioning of the zigzag is similar to that of the wye-delta, used as a grounding transformer in Fig. 2.

* See previous articles in April and May issues.

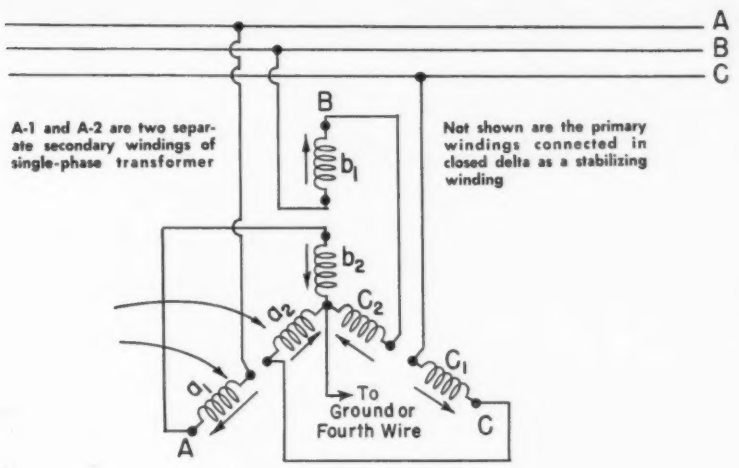



Fig. 4

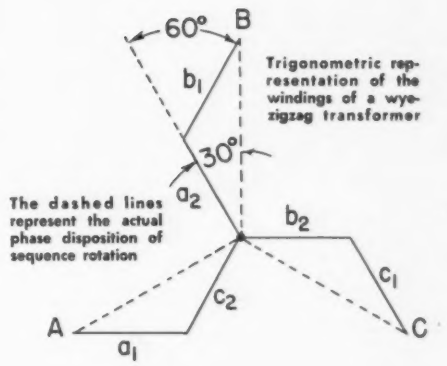


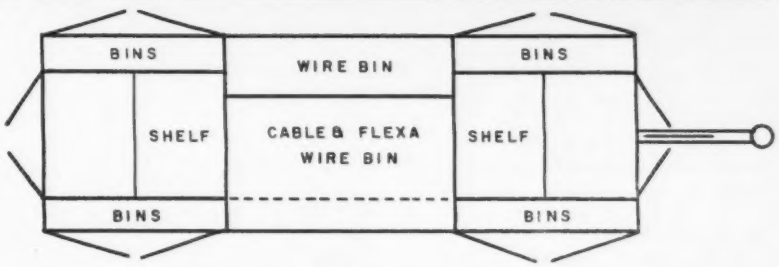

Fig. 5

As long as we have steady-state balanced-load on the line the two windings on each core leg oppose each other and no exchange of emf takes place. As an unbalance develops between the currents flowing in any two phase wires it is obvious that the two windings on a core leg are no longer going to be in direct opposition to each other.

A differential mmf is going to develop in the core leg and an exchange of emf is going to take place between the mated windings on that core leg. If a neutral conductor is carried from the wye (Star) point of the zigzag to the loads (distributed between the three phases), the differential unbalanced current is going to flow in the neutral. But the virtue of the zigzag (and likewise, the wye-delta) grounding transformer is that any extra current in one phase winding is going to induce a like current in the contraphase winding on the same core and force a more even distribution of the load on all three legs of the transformer.

Since the most that any neutral is going to carry (in 60-cycle fundamental unbalance current) is one-third of the current produced by the main supply transformer in each phase wire and since no phase of the grounding transformer is going to have to handle (under the worst possible load unbalance) more than two-thirds of this third in the neutral, the windings and core of the grounding transformer are normally designed for about 15 to 25% of the rated long time capacity of the main transformer. For large systems they may be only 10% of its capacity.

*(Next issue—"Their Performance" as fourth article in series)*




# His Shop Goes to the Job

No need to go back either for tools or materials when Ray E. Halfaker goes on a job. He carries his shop with him in the above compact, well designed trailer and Jeep. And it is a sizable stock and shop this Fresno, formerly Monterey Park, electrical contractor takes with him. The Jeep even has a generator connected to the drive shaft to provide temporary light or power for tools. It will go up any hill and park in any place a truck can go. Each axle is rated at 2,000 lb, giving 4,000 for the two. Under the bins there is space for 1,000 to 1,500 lb of conduit as well as space for fluorescent tubes. Ladders and long fluorescent fixtures are carried on top. The bins carry reels of wire in four colors, service entrance cable, non-metallic sheathed cable and all kinds of boxes, fittings, lamps and sockets. General use switches and circuit breakers, motor switches and starters are on the shelves and benders, electric drills and hammers and other tools at the rear near the pipe vise. In fact it carries about everything that his experience with its use since 1947 has indicated. Kept clean, painted and lettered, it makes a traveling ad as well. Halfaker is mostly alone but when he has more men it can keep them supplied. He has found it "a very handy gadget."

George de Gennaro

**Every member of the family can enjoy this kitchen without getting in Mother's way. It is functional, colorful, truly a . . .**

# Happy Go 'Lectric Kitchen

A kitchen that was designed to promote electrical living while it provides a showcase of ideas for builders or modernizers has been opened for display in the Los Angeles Department of Water & Power's Van Nuys office.

It got its name, Happy Go 'Lectric, in a public contest, which netted an all-electric kitchen valued at $3,600 for its winner and good publicity for the kitchen.

There is a place for every member of the family in this living area where all can gather and participate in homemaking activities without getting in each other's way.

Mother has a section all to herself with counter range, two ovens, refrigerator, sink and dishwasher. One hood serves the range top and the barbecue unit, which is in Dad's quarters, along with an ice maker and bar sink.

The teenagers have a soda fountain, underdrawer freezer for ice cream and other foods, a grill for hot dogs and hamburgers.

The laundry and sewing room is just off the kitchen area.

Neglected in many model homes and rooms, lighting had special attention in this department kitchen. A luminous ceiling gives even, shadowless illumination.

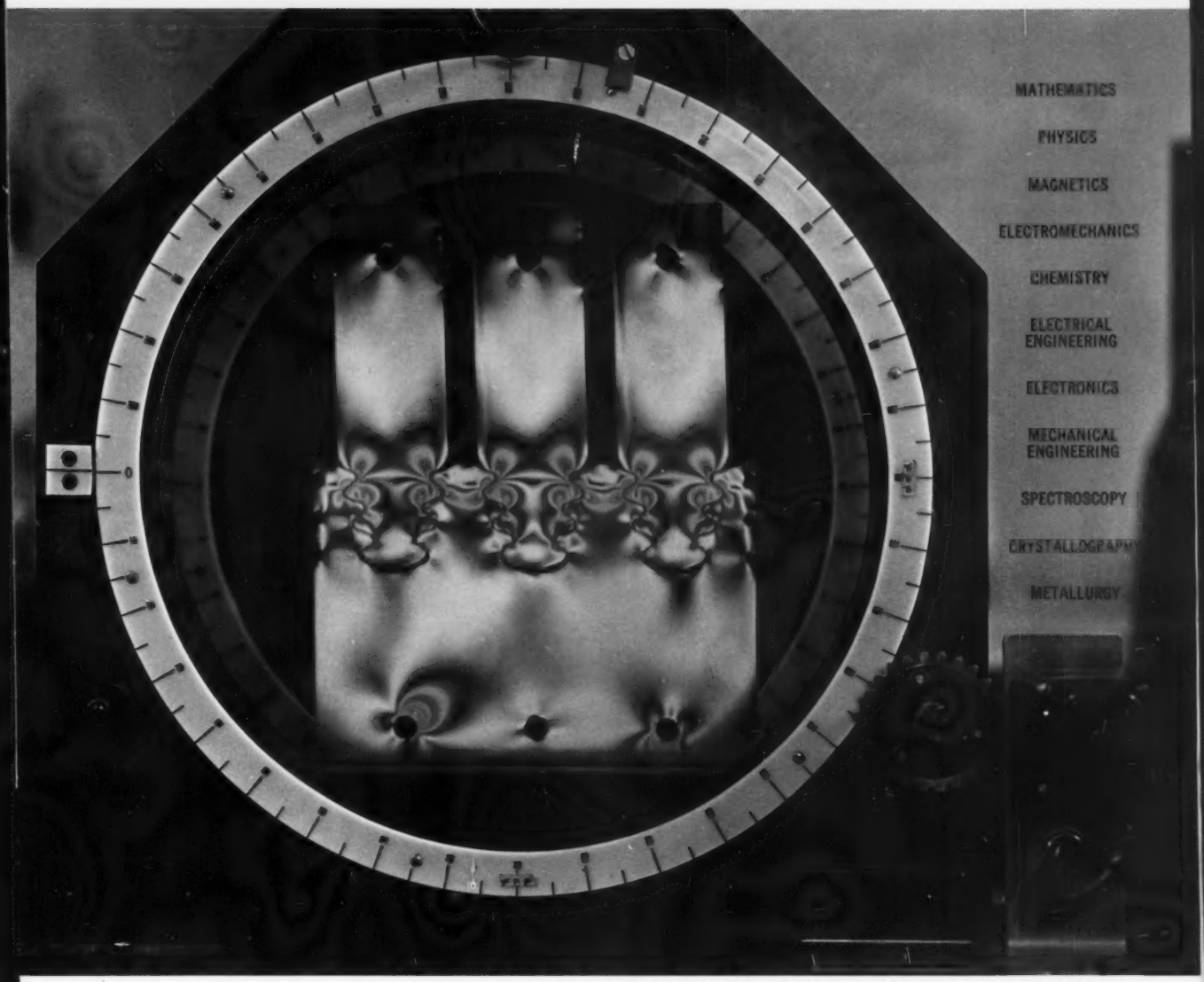
The color scheme is interesting, using Pacific blue and bamboo green with natural birch, a happy combination for the introductory 11-page, full-color feature in the Los Angeles Times Home magazine section.

Since it is primarily an idea kitchen, the Happy Go 'Lectric was not designed to be adopted as a whole. Rather the aim was to show latest trends in kitchen planning and to display new appliances in a proper setting. Duplications, therefore, that might not be practical in a home kitchen are to show the convenience of certain appliances in the various centers. Any of these centers could be copied or adapted to a new or remodeled kitchen.

Directing the designing were Kitchen Specialists Ralph and Jane Bonnell, a well known pair in the field. They were assisted by Mike Bolls of the department staff.

The model kitchen is a useful addition to the Van Nuys service center, which since its opening some two years ago has featured appliance displays by manufacturers.

**Here are some of the people who cooperated in the kitchen planning and promotion: (around the table) Michael Bolls, coordinator of kitchen plans and designs, and W. F. Lovelace, residential sales manager, Department of Water & Power; Norma Young, radio station KHJ; Ralph and Jane Bonnell, kitchen designers; W. S. Peterson, the Department's general manager and chief engineer; Barbara Lenox, feature writer, Home Magazine Section, Los Angeles Times; Carl K. Kraatz, executive vice-president, Construction Industries Exposition and Home Show of Southern California**




Photoelastic Test—Inside story of stresses on turbine blades

# The entire industry benefits from Westinghouse plowback of earnings

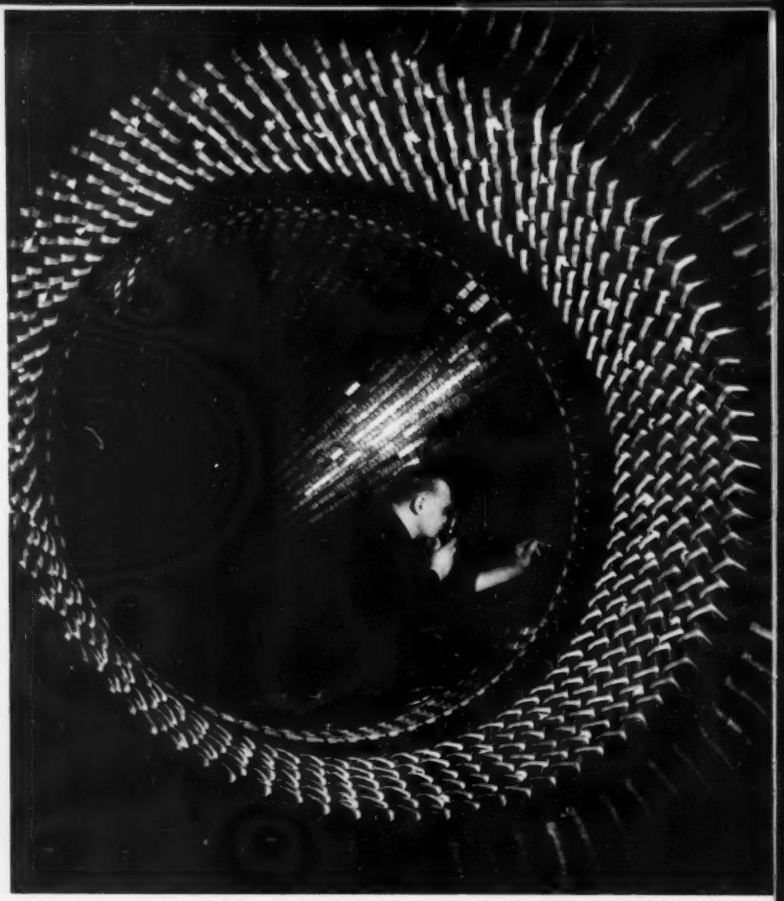
## RESEARCH CREATES BREAKTHROUGHS TO NEW KNOWLEDGE, BETTER PRODUCTS

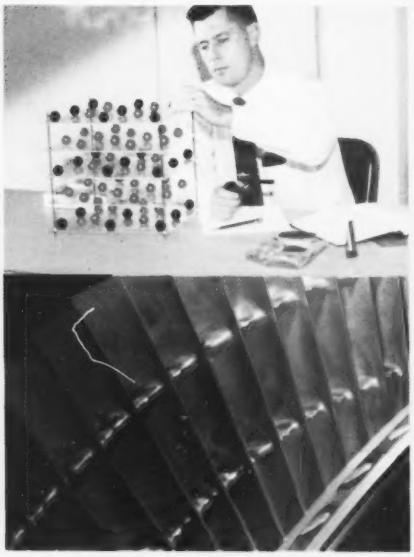
Fantastic load growth is projected for the next 10 years, 20 years, 30 years. The nation's electric utilities will meet it. What are the problems facing the industry? Bringing high voltage close to load, controlled dispatching; in generation—temperature, pressure, vibration, approach to theoretical limits of existing equipment, and a host of others. Out of this maze of interrelated problems, Westinghouse is bringing new products, new systems, new ideas to meet the many future needs of the electric utility. Westinghouse considers this program its obligation to the industry . . . an obligation fulfilled only by a broad policy of reinvestment of earnings into research and development.

New Westinghouse
Research Laboratories

YOU CAN BE SURE...IF IT'S Westinghouse

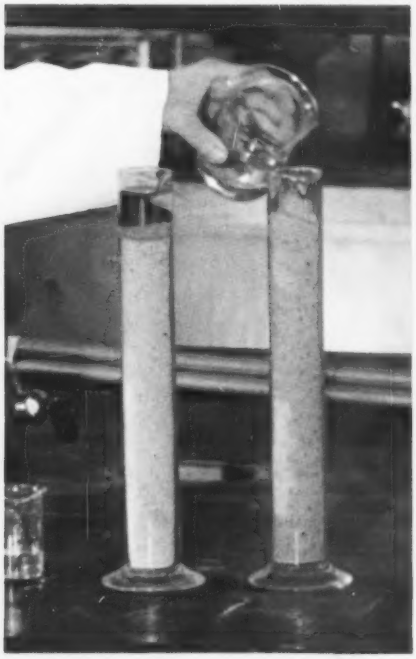
1. From 19 years' research . . . Thermalastic coil insulation, most stubborn insulation known





2. From a basic knowledge of metals and vibration . . . research with rifle accuracy

4. Electro-negative gas sponges up arcs



3. Making small molecules out of large ones cuts dry-type distribution transformer size up to 50%

6. At Materials Engineering, sureness is designed in

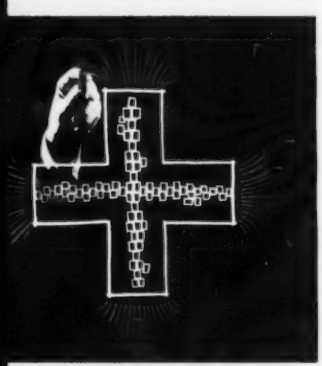
HERE IN THE WESTINGHOUSE
RESEARCH LABORATORIES

# 1958 was years ago

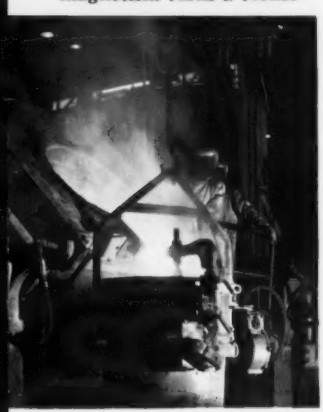
**PLOWBACK OF EARNINGS PRODUCES RADICALLY NEW METALS, INSULATION, PROCESSES**

Only one development in five from Westinghouse research is the result of a single science. Not only teams of scientists, but teams of sciences are today discovering new knowledge, channeling it toward practical applications of tomorrow.

Westinghouse fundamental research is a panoramic approach to solving the problems of the electric utility industry and to achieving the long-term objectives that underlie them.



5. In metallurgy . . . magnetism turns a corner



7. New metal alloys from formula to pilot-scale production

### 1. FROM 19 YEAR'S RESEARCH . . . THERMALASTIC COIL INSULATION, THE STUBBORNEST INSULATION KNOWN

What is it? An overlapping barrier of large mica splittings locked into a memory-type resin bond. It's thermally stable. Chemically inert. Rejects moisture. Won't embrittle. Stays elastic. Hugs the copper to which it is applied. Its reliability is proved by 40 million kva in service—on large motors and generators.

### 2. FROM A BASIC KNOWLEDGE OF METALS AND VIBRATION . . . RESEARCH WITH RIFLE ACCURACY

Problem—higher and higher pressures and temperatures, steam flowing through turbine blade paths at greater speeds. At the research center, mathematicians determine stresses; physicists make models of molecular structure of an alloy, recently created a new alloy, Nivco, testing at 100,000-psi tensile strength at 1200°F. This means that from Nivco will come more efficient turbines.

### 3. MAKING SMALL MOLECULES OUT OF LARGE ONES CUTS DRY-TYPE TRANSFORMER SIZE UP TO 50%

Remarkable solventless silicones, industry's newest high-temperature, high-voltage impregnants, lead a double life. Silicones in viscous form, with giant molecules, barely flow; their function is to stay put, hold mica flakes together. Fluid (right-hand flask) silicones' small molecules penetrate thoroughly and then form void-free solid insulation to stand heat better. Result—product size cut drastically.

### 4. ELECTRO-NEGATIVE GAS SPONGES UP ARCS

Presently applied on high-voltage switches, sulfur-hexafluoride is one of the most effective arc-interrupting agents known. In the test shown here, a 10-kv arc in the horizontal tube of air is instantly quenched when injected with $SF_6$ gas.

### 5. IN METALLURGY . . . MAGNETISM TURNS A CORNER

Cubex®, a newly developed alloy, breaks through a long-standing magnetic barrier, promises significantly improved performance of motors, transformers and other apparatus. The metal crystals are aligned in ice-cube fashion so that magnetism readily flows in four directions instead of two, turns corners with less resistance.

### 6. AT MATERIALS ENGINEERING, SURENESS IS DESIGNED IN

In the Materials Engineering Departments, research discoveries are transformed into practical engineering form. Projects are then turned over to operating divisions for application. An example is the procedure developed by Materials Engineering for ultrasonic testing of rotors and spindles. This procedure has contributed heavily to the unexcelled record for dependability of Westinghouse turbine generators.

### 7. NEW METAL ALLOYS FROM FORMULA TO PILOT-SCALE PRODUCTION

Bridging the gap between initial development and mass production is Blairsville . . . completely equipped for metals analysis and pilot-scale production. Nivco, alloys for atomic energy equipment and other metals used throughout the company are being developed here.

YOU CAN BE **SURE**...IF IT'S

**Westinghouse**

# Curiosity in depth . . .

**FROM 6000 ENGINEERS AND SCIENTISTS AND 200 LABORATORIES COME NEW KNOWLEDGE, NEW PRODUCTS, NEW SYSTEMS**

Laboratories in every operating division of the company are continually engaged in both long- and short-range product development and improvement programs. Many of these projects originate at the Research Laboratories, are further developed, designed and tested at the divisions. Most problems directly involved with product improvement are solved with the division's own facilities.

### 1. $7,500,000 WORTH OF ABSOLUTE QUIET

This is one of the world's largest anechoic half-spaces where complete sound measurements can be made on transformers far larger than any presently in service. With the help of this multimillion-dollar facility, transformers of the future will be smaller, lighter, quieter, more economical.

### 2. PUTTING THE PRESSURE ON GAS TURBINES AND COMPRESSORS

The variable density wind tunnel helps create vital design advances. It tests model blade profiles and paths under all operating pressure conditions. Highly loaded gas turbines can also be investigated. The most promising designs are selected for full-scale testing in high-power rigs.

### 3. $6,000,000 INVESTMENT IN ADVANCED TURBINE DEVELOPMENT

Through the work done at the new development laboratory, the Steam Division is now building the world's most efficient and one of the largest turbine generators, for 5000 psi 1200°F, the most advanced steam conditions now planned. Development work at the lab ranges from bearings to complete blade paths.

### 4. ONE TURBINE DEVELOPMENT CAN SAVE A UTILITY UP TO $450,000

In a 200,000-kw generating plant, 1% improvement in heat rate can, depending on fuel cost, justify a utility capital investment of up to $450,000. Photoelastic test of a new blade root shows stress concentration under simulated operating conditions. Tests like this lead to an array of turbine developments, providing increases in efficiency and savings to utilities.

### 5. FIVE MINUTES TO A BETTER TRANSFORMER

Power transformer design time has been drastically reduced by this IBM 705 computer, freeing engineering time for the creative development of tomorrow's transformers.

### 6. SEVEN VEILS AGAINST WEATHER

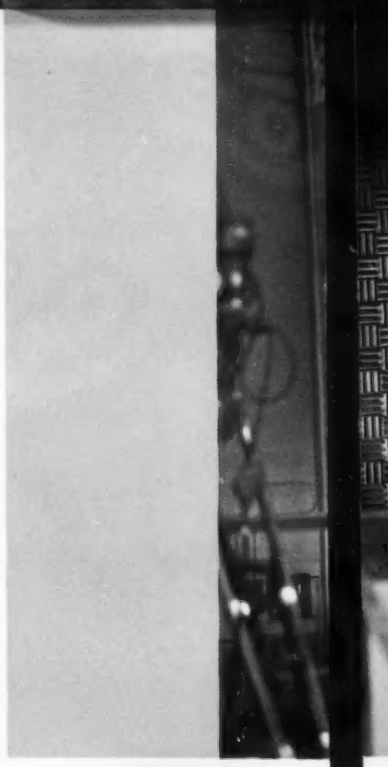
A half-million-dollar investment has created seven modern laboratory facilities for development of watthour meters at the new Raleigh plant—chemical, metallurgical, environmental, life test, mechanical, analysis and electrical development. From the chemical lab, for instance, come new organic and inorganic finishes for protection against everything from salt spray to ultraviolet light.

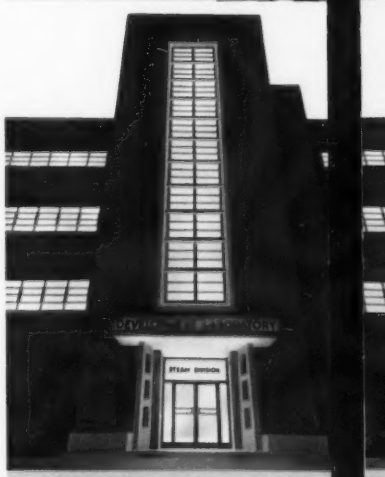
### 7. 5,200,000-VOLT SKYSCRAPER

Used in the verification and testing of new insulation systems for transformers, this surge generator is constructed from 104 100-kv capacitors in layers to a height of 52 feet. This unique design tool is part of the ultramodern transformer research and commercial testing laboratory.

### 8. THREE BILLION VOLT-AMPERES OF SURENESS

With capability to duplicate virtually every known system characteristic under controlled conditions, the High Power Laboratory has proved to be the industry's most valuable single design tool. For over 32 years, the capability and availability of this facility have fostered designs which have saved utilities millions of dollars.



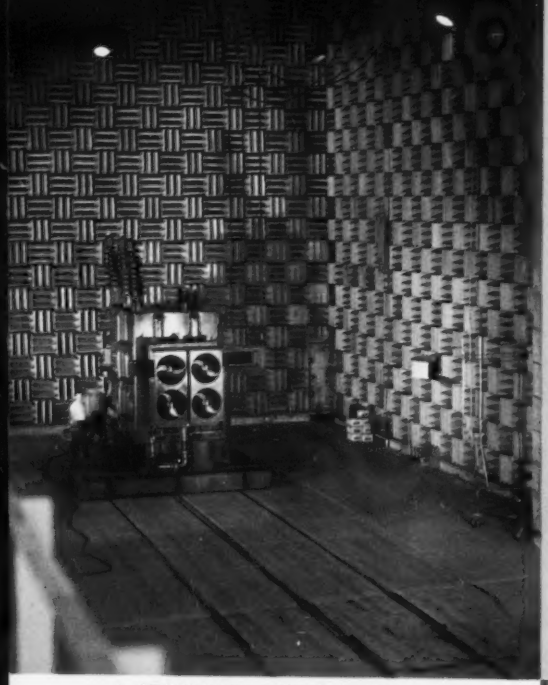


3. $6,000,000 investment in advanced turbine development

6. Seven veils against the weather

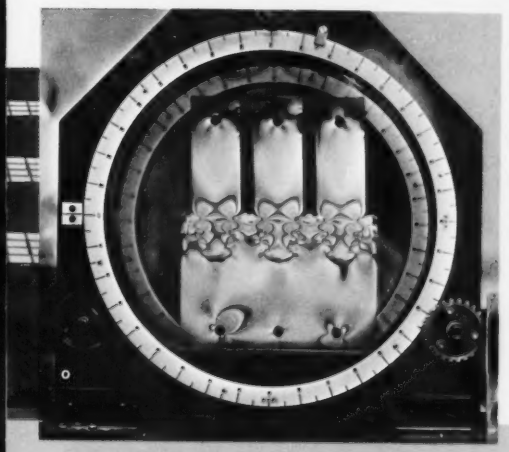
YOU CAN BE SURE...IF IT'S

# Westinghouse



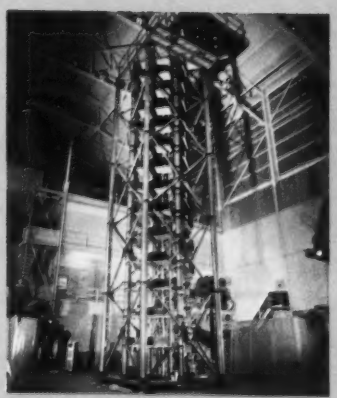
1. $7,500,000 worth of absolute quiet

2. Putting the pressure on gas turbines and compressors



4. One turbine development can save a utility up to $450,000

5. Five minutes to a better transformer

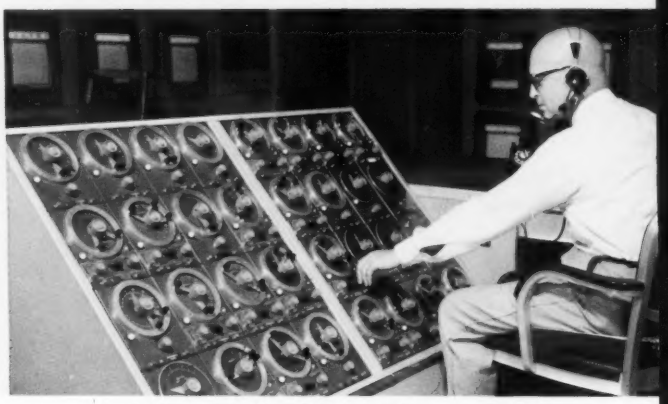


7. 5,200,000-volt skyscraper

8. Three billion volt-amperes of sureness

1. Out of snow and rocks . . . a laboratory

2. How to climb a mountain in total dark



3. Economic dispatch computer . . . nerve center of West Penn Electric interconnected system

# Plowback creates breakthroughs

**TO HELP UTILITIES PLAN FUTURE SYSTEM COORDINATION AND ECONOMICS**

A broad area of communications at Westinghouse, helping the industry plan, evaluate, test and apply new ideas and systems, is the Electric Utility Engineering Department. Within the department's engineering groups, for example, sponsor engineers, assigned to utilities in specific areas of the country, review broad application and engineering problems and direct studies for their solution. Other electric utility engineering groups are assigned to specialized problems and long-range studies advancing the fields of generation, transmission and distribution. Service engineers and consulting and application engineers provide a strong right arm in the field. These groups apply both a broad knowledge of the industry and specialized experience to your problems of today and to your objectives for the future.

## 1. OUT OF SNOW AND ROCKS . . . A LABORATORY

Broadening the test program that began with A.G.&E. at Tidd Station, an extra-high-voltage test transmission line has been built at 10,000 feet elevation in the Rockies in cooperation with Public Service Company of Colorado. For the specific purpose of measuring corona and radio influence especially under violent extremes of weather, voltages ranging from 173 to 500 kv are being investigated. Knowledge gained here will shorten the road

5. A five-state power network in one room

4. How lightning arresters keep ahead of lightning

to economical transmission of large blocks of power at super voltages, will help assure the equipment to handle it.

## 2. HOW TO CLIMB A MOUNTAIN IN TOTAL DARK

Automex—or automatic experimenter—could solve this kind of problem, if turned loose on it. At Westinghouse, its job is to reach a control objective when complete knowledge is not available. A general purpose automatic control, this machine studies problems, profits from its own mistakes. As part of an automation system, Automex may one day run an entire chemical plant or paper mill.

## 3. ECONOMIC DISPATCH COMPUTER . . . NERVE CENTER OF WEST PENN ELECTRIC INTERCONNECTED SYSTEM

Trends toward integration of whole power systems and interchange between systems put a premium on precision and speed of dispatching. The Westinghouse computer determines the most economical output of all generating stations automatically, specifies correct spread of load, greatly simplifies dispatchers' problems.

## 4. HOW LIGHTNING ARRESTERS KEEP AHEAD OF LIGHTNING

This SVS station arrester, even after 1200 lightning surge tests at the Switchgear Division, shows no change in performance characteristics. Improved Autovalve® arrester blocks, rigid production quality control, continuous high-voltage surge testing have produced designs reducing arrester discharge voltage by 20% in recent years.

## 5. A FIVE-STATE POWER NETWORK IN ONE ROOM

Here is the world's largest a-c network calculator, with 36 generating stations, 580 circuits, capable of simulating the largest power systems. System planning in the fields of voltage regulation, stability studies, short circuit analysis and many others has been an enormous timesaver to hundreds of utility engineers who have used this facility and who are welcome to do so.

YOU CAN BE SURE...IF IT'S Westinghouse

1. From Westinghouse will come the next "first" in atomic power

3. Super-pure . . . they count the molecules

2. Perpetual power at 450°F below zero

MADE POSSIBLE THROUGH WESTINGHOUSE REINVESTMENT OF EARNINGS . . .

# Ideas in research discipline the unknown

Research at Westinghouse is a vast quest for new knowledge. The electric utility industry has in the past benefited heavily from Westinghouse research. The industry is continuing to benefit—in money saved, in hours and years saved, in goals achieved—and will into the future. This is because Westinghouse is continuing to pour energy, imagination, talent, money into extensive programs of research.

### 1. FROM WESTINGHOUSE WILL COME THE NEXT "FIRST" IN ATOMIC POWER

The Westinghouse Testing Reactor will generate answers, not line kilowatts. This facility, under actual conditions of irradiation, temperature and pressure, will evaluate fuel elements and reactor equipment. Knowledge of nuclear technology gained here will enable utilities to produce commercial atomic power sooner and at lower cost.

### 2. PERPETUAL POWER AT 450°F BELOW ZERO

At temperatures such as this, many metals lose all measurable resistance, become perfect diamagnets, circulate induced electric current in a closed system—apparently forever. What will come from this superconductor development? Can electric power be stored? Will current in the future be transmitted over tiny wires instead of cable?

### 3. SUPER-PURE . . . THEY COUNT THE MOLECULES

The process is known as cage-zone refining, achieving metal pure to a few parts in a billion. Material being melted acts as its own crucible. The bar is melted progressively end to end, drawing impurities in one direction. Semiconductors now. In the future, a procession of useful developments will come from this basic work at Westinghouse. CP-1047

YOU CAN BE SURE...IF IT'S Westinghouse

# NOW Is The Time To Invest In The West

The West's share of the nation's electrical power industry expenditures is growing bigger every year, following this pattern:

| | |
|---|---|
| 1949 | 16.1% |
| 1954 | 17.4% |
| 1957 | 21.0% |
| 1958 | 21.5% |

At the present time the West with 15% of the country's people consumes 19.2% of the electrical energy, builds 26% of the country's homes, and accounts for 24.6% of the engineered construction backlog.

That's why many alert electrical manufacturers right now are profitably stepping up manufacturing, marketing and advertising efforts in the West.

***WHEN WE LOOK AHEAD A FEW YEARS THE IMPORTANCE OF TODAY'S SELLING INVESTMENT IN THE WEST BECOMES EVEN MORE SIGNIFICANT***

Between 1959 and 1975 total U. S. population growth will be 20.9%—11 Western States' increase will be 50.1%. The West will add 14.8 million people in this period, far more than any other region.

**PLAN NOW TO ADVERTISE IN THESE 1958 ISSUES:**

| | |
|---|---|
| **August** | ***—"Climate Control"*** |
| **September** | ***—"Annual Lighting Issue"*** |
| **October** | ***—"Invest for Profits"*** |
| **November** | ***—"Annual Buyers' Guide and Directory (First forms close Sept. 19, 1958)*** |

In these next 16 years the West's growth means the addition of a market duplicating the entire state of California as it is today. It means building new homes equal to all those in three cities the size of Los Angeles at a cost of about $100 billion. It means providing over 2,000 new schools; thousands of stores and other commercial structures and about $35 billion worth of new manufacturing plants.

***THIS IS WHY IT'S WISE TO ACT NOW TO PROTECT YOUR PRESENT SHARE OF THIS GREAT GROWING ELECTRICAL MARKET AND INSURE YOUR "% OF THE AVAILABLE" IN THE FUTURE.***

Regular advertising in ELECTRICAL WEST is an important part of your Western Market investment. Its 12,500 subscribers ***are*** the electrical industry of the West. Its circulation growth parallels the growth of the market. Nowhere else can electrical equipment sales efforts be backed up with the impact, depth and scope offered by advertising sales messages in this magazine.

***NOW IS THE TIME TO INVEST IN THE WEST. NOW IS THE TIME TO BE ADVERTISING REGULARLY IN ELECTRICAL WEST***

## *ELECTRICAL WEST*

68 Post St.,
San Francisco 4, California
A McGraw-Hill Publication

***Spokesman of the Electrical Industry of the West for 70 Years***

Ralph Rohrbach, Western vice-president, Arthur Hooper and President George Albiez

# NAED Celebrates its Golden Anniversary by the Golden Gate

Just as the pioneer electrical supply jobbers had come West to establish their businesses over 50 years ago, forming the first association, the dignified successor organization, National Association of Electrical Distributors, came West to the Golden Gate, San Francisco, for its 50th or Golden Anniversary Convention, June 8 to 12. Some 3,000 filled the hotels of San Francisco and used the new "Mole Hall" at the Civic Auditorium for conferences with manufacturers who supply them with their wares.

Besides the serious and inspirational business sessions each morning, and the individual conferences with the manufacturers each afternoon, they were royally entertained and treated to the sights of San Francisco, in the first Western convention since 1920.

Both nostalgia over the past and a forward look into the future characterized the business sessions.

In welcoming the participants from all over the United States, Ralph W. Rohrbach, Pacific Wholesale Electric Co., San Diego, Western region vice-president, analyzed the meaning of the slogan, "Wholesale Distribution: The Most Economical Channel," and gave the convention its direction by declaring that through the association's training and educational benefits, the members could prove that theirs truly was the most economical and educational channel of distribution for electrical supplies.

An impressive color guard presentation of colors, an invocation by the Rev. John E. McGarity of Old St. Mary's Church and a welcome by Mayor George Christopher of San Francisco prefaced the two major addresses and the skit which comprised the first session program.

Rev. Herman J. Hauck, S. J., president of the University of Santa Clara, reminded his listeners that God's challenge to mankind was to "subdue the earth." He demonstrated that this meant a complete study of all of its forces and resources and the application of imagination to the never-ending task of mastering the earth. Such challenges as "why God made Nevada" still remain to be met, for even the desert could be made to bloom by man's ingenuity and enterprise.

With complete optimism as to the future of the electrical industry, Robert R. Gros, vice-president, Pacific Gas and Electric Co., cited the growth factors upon which he based his observations. The building programs of the utilities of the nation, his own company's part in this overall construction effort, population growth, and industrial productivity, provide the opportunity, he said.

In talking thus to the selling forces of the industry, he said, "If your segment of the industry can really sell this productivity and this construction, you can be the force that pulls us out of this recession." He went on to point out that, although the industry produces so many automatic devices, "there is nothing automatic about selling these automatic gadgets. Salesmen and salesmanship will be the last thing to be automated."

Of "Jobberwacky," a skit that closed the first morning's session, the less said the better. It completely missed its opportunity to pay tribute to some of the early-day pioneering in the wholesale distribution business, evidently because its writer Don Knapp of KGO, knew little of the industry. It was well directed by Gene Whitworth of PG and E. Five professional actors appeared in it, aided in a series of tableaux by 10 stand-ins from the electrical industry.

Distributors' own problems held the platform for Tuesday morning's session. George W. Provost Jr., vice-president of the Eastern Region, in introducing Paul E. Orr Jr., president of Management Planning Inc., stressed the growing importance that manufacturers have been forced to place on their channels of distribution, because of the scrutiny that security analysts give them when they require financing.

Since most independent distributors are closely owned corporations, Orr's topic had special interest, particularly since he showed graphically the leverage of taxes. Every dollar saved in taxes means the equivalent of $35, he pointed out by means of charts and hence the saving of tax dollars is a most valuable operating procedure. He likewise told of the effect on compensation methods for executives. To make more incentive or inducement for obtaining and keeping good executives, he spoke of five methods for deferring compensation to protect them against big tax deductions. Maintaining of family control after the death of the owner was likewise discussed in the light of heavy estate taxes that have to be paid in cash. He urged taking steps by scientific evaluation so that government claims could be countered with factual proof.

New president, J. F. Hamblen, Houston, addressed the San Francisco Electric Club

President George Albiez, Englewood Electrical Supply Co. of Bridgeport, in his presidential address, set forth the tenets of an electrical distributor. These principles of operation and of ethics relate the distributor to the manufacturer whom he represents and the contractor and industrial customer whom he supplies. Some manufacturers, he said, doubt the ability of a distributor to handle his line satisfactorily. However, if he will first set up proper monetary incentives, and then make a careful appraisal of the efforts of the distributor, Albiez declared, "He will find him to be a most economical form of distribution. I have heard it said that this is a big business with too many small people in it. But if we think big, act big, and above all be big, I am sure we can live up to our responsibility."

The rest of the morning session was devoted to a "Let's Swap Ideas" session, in which Thomas B. Favrot of New Orleans described a charge-a-plate invoicing system he uses; Lester May of Kewanee described estimating forms supplied to contractors in his area to make them better estimators; Robert M. Johannesen of Greensboro described mechanized office procedures; C. P. Andrew of Newport News advocated charging interest on past-due accounts; George W. Provost Jr. of Pittsburgh and Forrest H. Fitzsimmons illustrated an integrated data processing system for electrical distributors.

From the West, Jack D. Smith, Coast Wholesale Electric Co., Burbank, showed how this company handles its wire stock and cuts and handles it for customers. Where formerly it took two or three men to handle the reels and make each cut, now with one man specializing on the wire handling, savings are made not only in manpower but likewise in inventory of short lengths of wire.

Jack Smith

The man who was later elected president, J. P. Hamblen, Southern Electric Supply Co. of Houston, presided over the last general session. Feature of this session was the analysis of the electrical distribution picture, presented by Dr. Edwin H. Lewis, professor of marketing, University of Minnesota School of Business Administration. (See Electrical Wholesaling, June 1958, p 61-140.) Having completed a study for NAED of the entire distribution pattern, Dr. Lewis presented his findings and recommendations. After analyzing the sources of distribution available to a manufacturer, and the shortcomings as well as the strengths of distributors, and the competitive situation ahead, he said that the key to the future was flexibility to meet any changes that come in the fast-moving business world.

A Junior Achievement Award made by NAED each year was presented to Roger Hanson, a poised and capable high school senior from the Los Angeles area. The Electric Housewares Award to Raybro Electric Supplies Inc. of Tampa, Fla., was made by J. P. McIlhenny, chairman of the NEMA Electric Housewares Section and vice-president in charge of sales, Waring Products Corp. McIlhenny spoke of the growing housewares market now reaching a $2,000,000,000 volume each year, and with a number of new products emerging from laboratories.

Of the nine honorary life memberships presented, three were to Westerners. They were Ross Hartley, formerly with The Electric Corp. of California at Los Angeles; Harold Thrane, formerly with General Electric Supply Co., Los Angeles; and

Robert Gros, PG and E, and Rev. H. J. Hauck, Santa Clara, Western speakers

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**SMOOTH BORING POWER AND BRACE BITS**
Wide choice of bits for smooth boring, long life on every type of job. See your distributor or write for catalog.

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1767 Columbia Avenue, Rockford, Illinois

Kimberlin

Roy W. Kimberlin, formely with Graybar Electric Co., San Francisco—all retired. Kimberlin was the only one present to receive the award at the time. Proxies received for the others.

One Western distributor was on the concluding panel of manufacturers and distributors in which each was asked to define what his idea of the distributor's function to be. James B. Hartwig, North Coast Electric Co., Seattle, was the Westerner. His paper, as well as one by J. C. Hicks of Harvey Hubbell Inc., Bridgeport, will be published in a future issue.

A new sales training course for distributor salesmen developed by Porter Henry & Co. Inc., was described by Mr. Henry. By use of tape recordings of sales interviews and questions to salesmen, some of which were played back to the convention, a special course has been developed.

### Hooper Reports

At the membership final meeting Thursday morning, Arthur W. Hooper, executive director of NAED, proposed that it be conducted at some central place in the United States so that it could be reached by men from all parts of the country more conveniently.

Hooper also exhorted the members to live up to the ideals and tenets set forth by President Albiez, for their own self respect and the respect of the industry for the place of the supply distributor in the economy.

In the election of officers, J. P. Hamblen of Houston was elected president to succeed George Albiez of Chicago. To succeed him on the executive committee, J. A. Meier of Florida Electric Supply Inc., Tampa, was named vice-president of the Southern Region. Ralph W. Rohrbach, Pacific Wholesale Electric Co., San Diego, had previously been elect-

**Earl Morton, San Francisco manager, was given a 25-year pin by B. H. Boatner, WESCO general sales manager, at a party**

**President and Mrs. Joe Thompson, Federal Pacific Electric Co., got right into the Gay Nineties act at their Pisco Punch party for NAED visitors at the Bohemian Club**

ed vice-president of the Western Region last September. George W. Provost Jr. and J. M. Vilett were re-elected vice-presidents of the Eastern and Central regions respectively. John P. Lawton, Graybar Electric Co., Seattle; H. F. Boeger, Standard Electric Co., Oakland, and Kenneth Hartley, The Electric Corp. of California, Los Angeles, were named new members of the Board of Governors for Zone 9.

Working quietly and fervently behind the scenes throughout were many members of the Western Region and their managing director William Jewell to assist the national staff and officers with the tremendous detail involved.

## Meetings Coming Up

—Electrical Contractors Assn. of B. C., annual convention, Victoria, B. C., Aug. 7-9.
—American Institute of Electrical Engineers, Pacific general meeting, Sacramento, Aug. 19-22.
—Western Electronics Show and Convention, Pan Pacific Auditorium for show, Ambassador Hotel for convention, Los Angeles, Aug. 19-22.
—Northwest Public Power Assn., Power Use Section, at Malaspina Hotel, Nanaimo, B. C., Sept. 10-12.
—Rocky Mountain Electrical League, annual convention, Jackson Lake Lodge, Moran, Wyo., Sept. 14-17.
—Northwest Electric Light & Power Assn., annual meeting, Sun Valley Lodge, Idaho, Sept. 17-19.
—National Industrial Service Assn., Rocky Mountain and Utah Chapter joint meeting, Aspen, Colo., Sept. 19-20; Northwest conference, Portland, Oct. 10.
—Northwestern Section, International Association of Electrical Inspectors, Northern Hotel, Billings, Mont., Sept. 15-17.
—Southwestern Section, IAEI, Disneyland Hotel, Anaheim, Calif., Sept. 22-24.

**A new IES chapter is in the making in the San Bernardino area and W. N. Ritter and Gordon F. Burgess, both California Electric Power, are temporary secretary and chairman and leaders in organizing it**

**UNBREAKABLE VINYL**
— can't crack, chip, or break.

**MOLDED-IN CONSTRUCTION**
— blades, contacts, terminals locked in . . . nothing can wobble, work loose, or fall out.

**DEAD FRONT CAPS**
—back-wired for greater safety. No fiber washers to fuss with or lose.

NEW Unbreakable PVC ROYALOK®

**ONE-PIECE CONNECTORS**
— no eyelets or rivets. Double-wipe contacts permanently anchored in vinyl bodies.

**RIGHT FOR EVERY JOB**
— unbreakable vinyl resists acid, oil, grease . . . can't break under roughest use.

ONLY PVC ROYALOK® OFFERS SO MUCH!

**SAFER, EASIER TO WIRE**
— you get clean, safe wiring every time. Handy fact-tag with each device shows simple, easy wiring.

Now you don't have to tie up cash and shelf space with attachment caps and connectors of many different materials. Only one . . . the new PVC . . . has ALL the qualities necessary to make it serviceable under even the most severe conditions. Don't wait . . . order PVC — TODAY!

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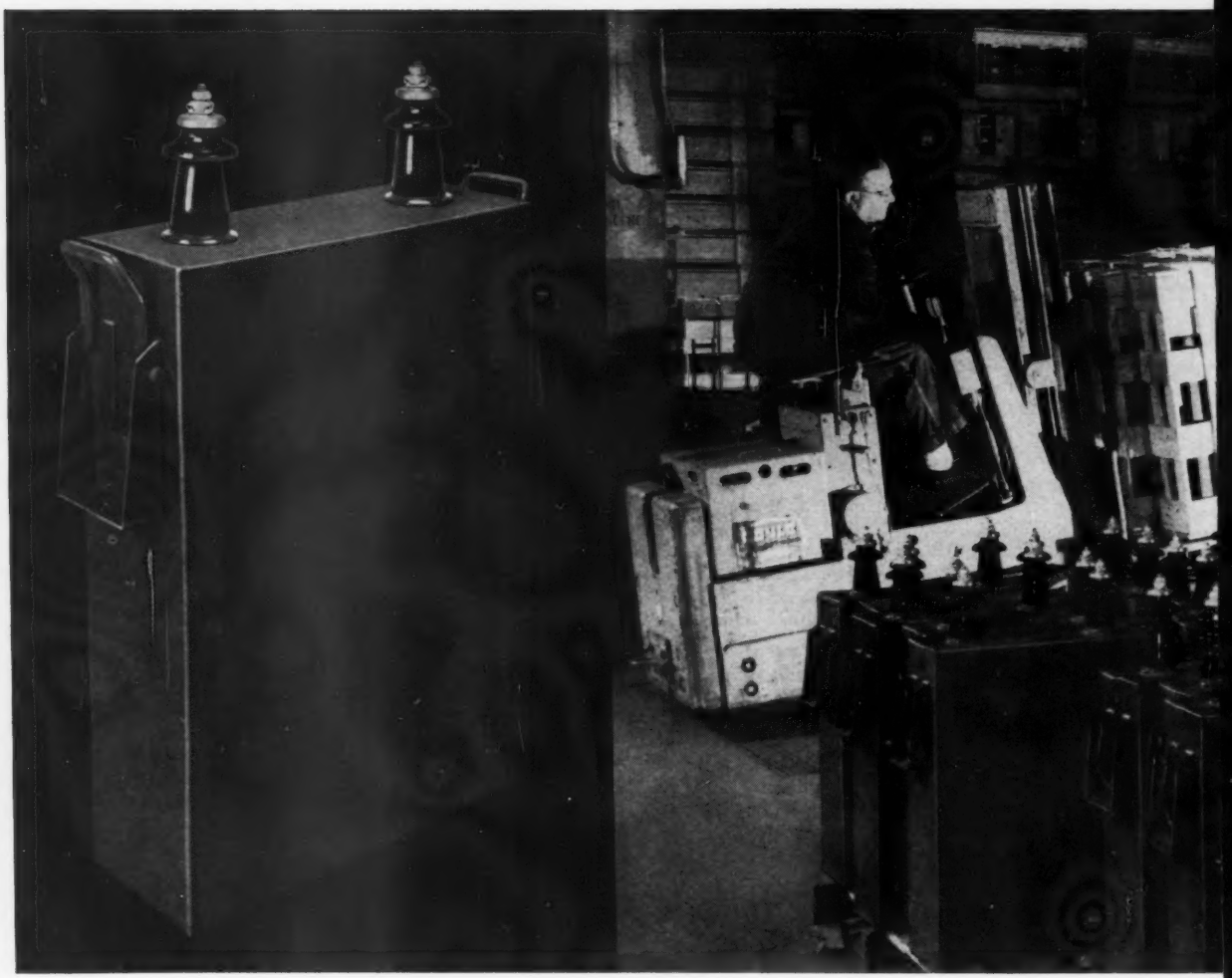


Another product of Plowback of Earnings into research

# 100-Kvar Capacitors Now Ready for Shipment

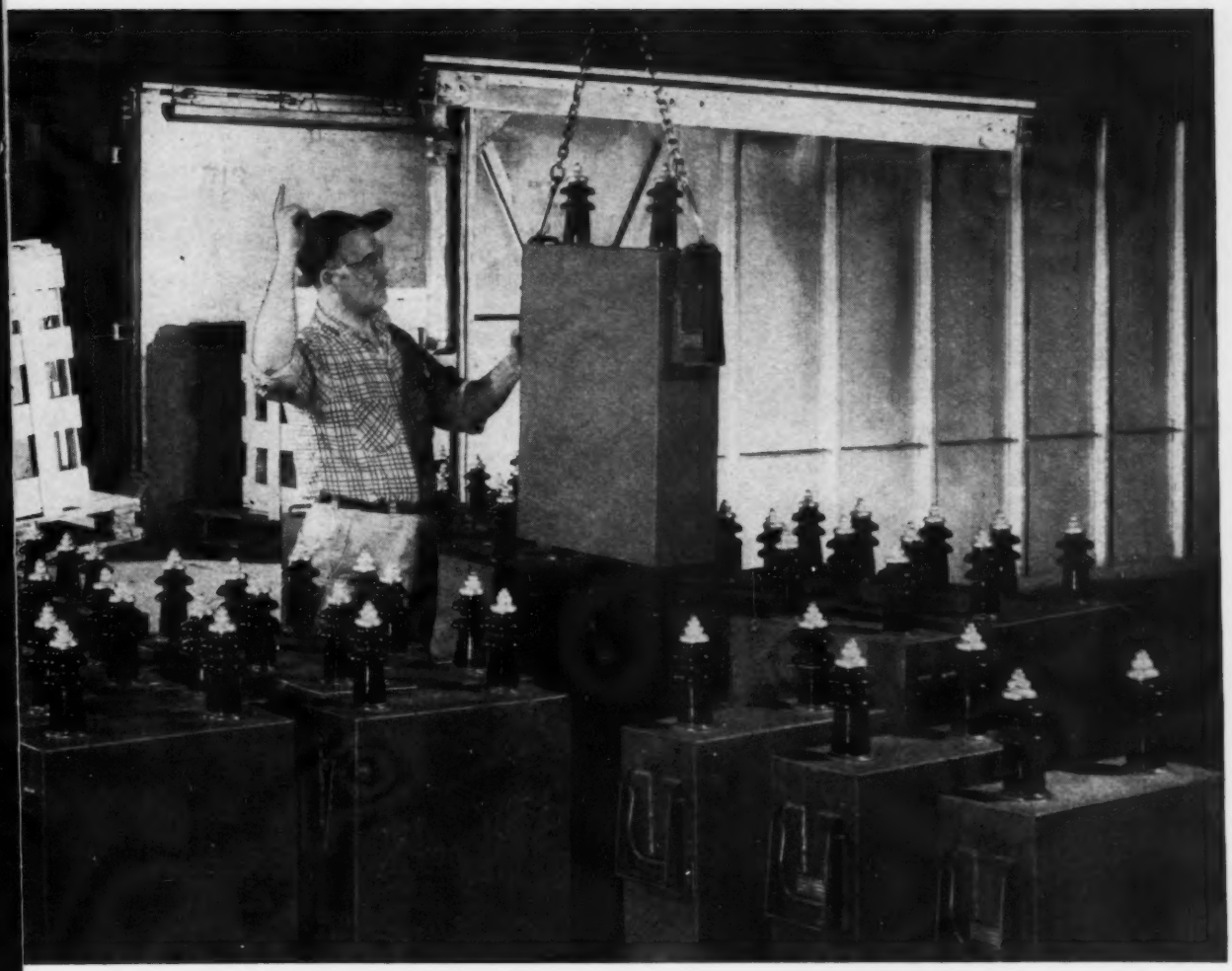
Anticipating the industry's need for larger blocks of reactive power, Westinghouse engineers developed this new 100-kilovar capacitor to boost kvar output per unit . . . *more economically* and conveniently than ever.

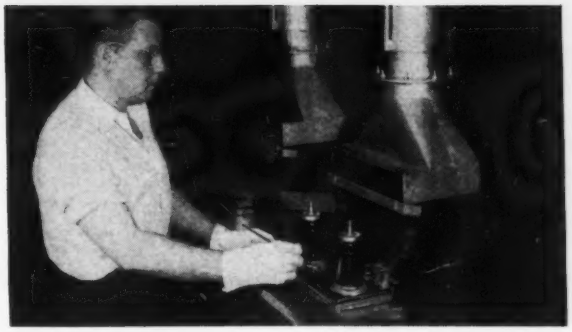
These units are in regular production, and shipments are being made to meet the tremendous demand expected for this new product.

Following the long-established policy of reinvestment of earnings for research, these new capacitors feature the high quality and outstanding performance always associated with Westinghouse capacitors. Continual testing during assembly assures top reliability . . . after years of service.

For complete information about the new 100-kvar capacitors and the way they can save you money, call your Westinghouse sales engineer or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-60951





**Solder-sealed bushings assure hermetic seal.** Complete freedom from leaks or contamination of dielectric is assured. Wet-process porcelain bushings give maximum strength and excellent insulation value.

**Zinc spray finish guarantees maximum protection.** A lifetime corrosion-resistant coat of metallic zinc, sprayed on to a minimum thickness of eight mils, insures unparalleled case life under the most adverse conditions.

YOU CAN BE SURE...IF IT'S Westinghouse

Electrical West—Vol. 121, No. 1

# news

Pacific Gas and Electric executives played host to a special trainload of California publishers who were taken into the High Sierra to see new developments on PG and E's Stairway of Power, along the Feather River. Left to right: Robert Gros, PG and E vice-president; Paul Leake, Woodland Daily Democrat; S. L. Sibley, PG and E vice-president and general manager; Dan Beebe, Oroville Mercury; P G and E President N. R. Sutherland. *(See Growth)*

Equipped to produce virtually every type of transient overvoltage and overcurrent disturbance occurring on a system, this research lab will be opened by Hubbard & Co. *(See Manufacturers)*

Starting a journey to the engineering school at Oregon State College is this four-ton calculating board, being lowered from the sixth floor of Portland General Electric Co. PGE is giving OSC the $35,000 calculator, a forerunner of a larger, more complex machine—the Enns network computer—installed last summer. It was designed by Waldo Enns, PGE chief system engineer.

W. L. Greer, San Francisco commercial manager for PG and E, and C. W. Goodwin of G-E Supply Co., president of the Northern California Electrical Bureau, display the Better Buy Now banner at the opening breakfast in San Francisco. Similar meetings all over the PG and E system are pushing this promotion to step up appliance sales. *(See Market Development)*

EW

# Management

## Water, Water Everywhere

The Colorado River states continued to present their claims for waters of that stream at hearings held in San Francisco recently. California claims it has a right to 5,362,000 acre-ft, Arizona claims 3,800,000 acre-ft, Nevada is asking for 800,000 acre-ft and New Mexico is trying to stake claim on some 115,000 acre-ft, all the latter to be diverted from Colorado River tributaries. Utah is asking for 125,200 acre-ft from Colorado tributaries in the lower basin area of the state.

On the Columbia the Department of Interior is studying the feasibility of a third power house at Grand Coulee. Secretary Seaton said that even without additional upstream storage the third power house has not been ruled out as yet but he stressed the need for reaching an agreement with Canada for building major storage dams north of the border. Farther down the river, the proposed Wanapum project was assured of another customer for 48,000 kw of power when the city of Tacoma picked up its option to purchase an 8% share of the output.

On the Skagit, Seattle City Light is operating Ross power house only at peak hours in order to fill the reservoir behind Ross Dam to get storage for next winter's peak. A light snowfall in the Cascades has caused a water shortage that is forcing City Light to purchase extra power from outside sources.

Down in Oregon, the California Oregon Power Co. and the State of California have agreed to a 60-day test schedule designed to end litigation over fluctuations of the Klamath River caused by Copco's power generating operations. Beginning last month, Copco will reduce fluctuations in the river to a rate of 9 in. per hour and the state will conduct studies to determine if such a flow schedule will prevent the loss of fish life and remove danger to persons using the Klamath River below the Copco plants. Flows in the river will vary from 500 to 3,200 cfs.

► Puget Sound Power & Light will replace the present unfunded retirement program Jan. 1 with a fully funded retirement program. The plan, which is still subject to findings by the U. S. Treasury Department that it is qualified under the Internal Revenue Code, will provide a fixed monthly benefit for life after retirement for Puget Sound employees. The cost of the plan is to be paid entirely by the company.

The announcement of the new retirement plan follows the establishment of three new medical plans for Puget employees. One of these covers the thousand members of IBEW, a second 600 employees including some union members and all nonunion employees and the third is for retired employees.

## Republicans Approve CVC

► The Oregon Republican State Central Committee has approved the "concept" of the regional federal corporation for hydroelectric development of the Columbia River. In so doing Oregon Republicans climb in bed with public power Senators Neuberger and Morse, the former having introduced the bill to set up the corporation.

► Sidney N. Coates, president of Coates Electric Mfg. Co., has announced his candidacy for the Republican nomination for U. S. senator from Washington. His principal plank will be the "promotion of better management-labor relations."

► The Wyoming State Board of Equalization's ruling that municipally owned electric plants are subject to state and school district property taxation was upheld in the district court. The 12 affected Wyoming towns have served notice they will appeal to the Wyoming Supreme Court. Meanwhile, the Wyoming Association of Municipalities has urged that the 1959 state legislature be asked to define city operation of electric utilities as "a government function," thereby exempting them from taxation.

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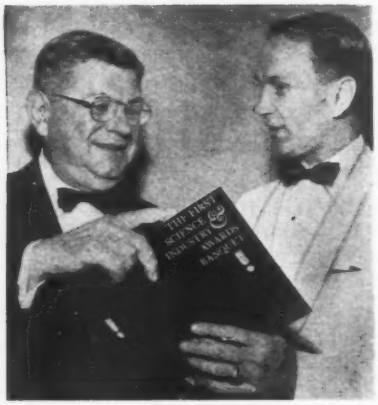
## Graduate Center at Hanford

The University of Washington will assume administrative responsibility for a graduate training program at Hanford Works July 1 under a contract approved by the university's Board of Regents and the AEC. This new educational facility will supplant the nuclear engineering school that has been conducted since 1946 by the General Electric Co. under a cooperative arrangement involving the University of Washington and other state institutions in the area. The school will be known as the "University of Washington Center for Graduate Study at Hanford." It will provide instruction at the upper division and graduate level in courses in nuclear, chemical, civil, electrical, mechanical and metallurgical engineering as well as advanced science. Enrollment preference will be given to employees of the AEC, General Electric Co., contractors to the AEC and employees of government agencies. Courses will be taught primarily by qualified AEC and G-E employees with some instruction given by faculty members of the university, but no full-time resident teaching staff is contemplated at present.

## Corette Heads EEI

J. E. Corette, president of the Montana Power Co., was chosen the leader of the investor-owned utilities for the coming year by his election as president of the Edison Electric Institute during its annual convention held in Boston last month. He has been active nationally and internationally in industry affairs.

Corette



President Norman R. Sutherland of Pacific Gas and Electric Co. was named "California Industrialist of the Year 1957" by the California Museum of Science and Industry. He is shown (left) with Lt. Gen. James M. Gavin, recently retired chief of Army research and development, who addressed the 1,400 scientific and industrial leaders who attended the awards banquet in Los Angeles. Sutherland was cited for outstanding achievement in industrial management, notably in guiding PG and E's $2 billion expansion program and for spearheading construction of the country's first privately financed atomic power plant in cooperation with G-E

► Richard C. Setterstrom, industrial development engineer for the Montana Power Co., has been appointed to the Small Business Administration's National Board of Field Advisors. He has been with Montana Power since 1940 and is chairman of the Montana Planning Board's advisory council and past chairman of the industrial committees of both the Montana Chamber of Commerce and the Butte Chamber of Commerce. He was president of the Northwest Electric Light & Power Assn. in 1955-56.

► The Tri-State Generation & Transmission Assn., composed of 25 rural electric cooperatives in Colorado, Wyoming and Montana, has moved its headquarters from Loveland, Colo., to the Continental Oil Building in Denver. The G&T association purchases electric power under one contract from the Bureau of Reclamation for its members.

► Montana Power Co. has deeded certain key lands to the Montana Fish & Game Commission without charge as a contribution to the benefit of sportsmen throughout the state. The lands were needed for water supply necessary in planning the Lewiston, Mont., fish hatchery facilities.

# Growth

## Cause and Effect

Two growth items in the Los Angeles area bring home the importance of capital expenditures and their effect on our industry and the economy in general. Two redevelopment projects in the service area of the Los Angeles Department of Water & Power are estimated to require peak loads of 60,000 kw and 50,000 kw each. The first is the 20th Century-Fox hotel, apartment and office project which will occupy most of the current studio lot, and is expected to cost $400,000,000. A smaller $300,000,000 project on the property of the Ambassador Hotel will have about the same facilities. A 10% rule of thumb would indicate $70,000,000 of electrical content in these developments.

A second news item points up the fact that the Department of Water & Power's new Scattergood steam station is nearing the half-way mark. The load mentioned above will eat up a good bit of the power generated by one of the two units, each capable of 156,000 kw. The station with two of its four units installed will cost about $60,000,000. Add to this the transmission and distribution facilities necessary to link Scattergood with the new super shopping centers and it isn't difficult to tie in electrical equipment expenditures of more than $100,000,000.

► Elsewhere in Southern California, Southern California Edison is placing the first unit at the Huntington Beach station in commercial operation by the end of the month. A second unit will be on the line by the end of the year—a total of 400,000 kw. Next year, more of the same with 400,000 kw of Mandalay.

► Further inland, Calectric Power brings its second 60,000-kw unit on the line by the end of June, and will begin work on the first of two 60,000-kw units at the Barstow generating plant.

► In northern California, three new power houses—Poe, Butt Valley and Caribou No. 2—are scheduled for completion in 1958. These three dams, representing an investment of $71,000,000, will add 250,000 kw of generating capacity to serve northern and central California. These three dams will become part of a chain of nine PG and E power houses on the north fork of the Feather River, representing a combined capacity of 636,000 kw — enough to supply twice the needs of a city the size of San Francisco. A tenth plant, not yet under construction, will add an additional 113,000 kw. Further downstream is the site of the Oroville Dam, a flood control project of the State of California, which will produce 440,000 kw as a by-product, making a grand total for the mighty Feather of 1,118,000 kw. That's some creek!

Caribou No. 2, a 109-000-kw station—probably largest outdoor power station in West

# POLE STAR IS THE

**REGISTERED TRADEMARK** of a complete line of distribution transformers manufactured by Pennsylvania Transformer Division, McGraw-Edison Company. We are grateful for the nationwide acceptance that has made the words POLE STAR almost synonomous with "distribution transformer."

We wish to remind that the user benefits associated with the name POLE STAR are obtainable, in their entirety, only with the distribution transformer products of this manufacturer.

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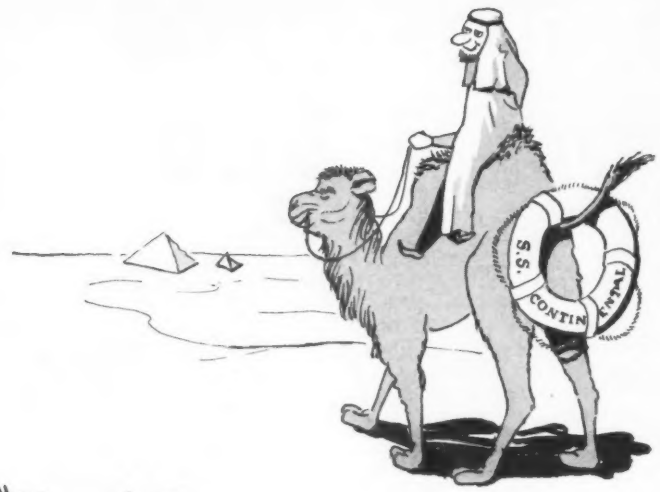
**McGRAW-EDISON COMPANY, CANONSBURG, PA.**




"Pays to be on the safe side... mirages, you know"

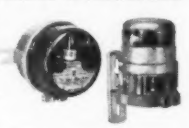
Back in 1945 when we started out in the photoelectric lighting control business, we (too) bent way over backwards in favor of precautions. One such life preserver — time delay — is still around. Although we did and still do supply controls with it, experience has proved that time delay is about as useful as a life preserver in the desert.

Theoretically, time delay is a safeguard against street lights being turned off at night as a result of a lightning flash, car headlight or helicopter tail light. In those early days, when a single control was probably mounted close to the ground and switched hundreds of lights, accidental turn-off was something too horrible even to contemplate. Time delay was supposed to minimize this.

Now, the growing practice of using one control per light, mounting controls higher in the air — and the facts — have convinced us that time delay is an extractable luxury. In those rare cases where a control gets mounted right in line with somebody's beacon or headlights, reorienting a delay-less control a few degrees solves that problem.

As for lightning flashes (one of the more popular "reasons" for time delay) considerable field experience has been accumulated on more than 2000 Fisher-Pierce controls. Some of these controls were a new design with a fraction-of-a-second delay, others were standard design without time delay and built especially for this experiment. Not a single turn-off as a result of a lightning flash has been reported. You might be as surprised as we were to discover that a lightning flash lasts only about 1,000 microseconds and its light intensity, measured at the control, doesn't begin to approach a value great enough (for a long enough time) to trigger a Fisher-Pierce control.

When you tell us to skip time delay, we can give you a control that's simpler, more reliable, easier to install and maintain and that costs less. Caution is one thing, but buying something you don't need is another. The Fisher-Pierce Co., 43 Pearl St., So. Braintree 85, Mass.



FP

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PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

# Contractors

## Golden Anniversary

Seth Cohn and his bride of 58 years ago, Elizabeth Cohn, celebrated their 50th year in business in San Mateo as Atlas Electric Co. at a dinner party in their honor June 7. Over 150 friends, associates and people in the community attended and paid tribute to the tiny pioneer couple who have been ever active, both in civic affairs and in industry associations and activities. Everett Marshall, president of the Peninsula Electrical Contractors Assn. of which Cohn is a charter member, presided, Dave McCullough acted as master of ceremonies. Werner Diedrichsen, manager of IBEW Local 617, presented Seth Cohn a gold life membership in the local.

**Seth Cohn**

Many former employees, competitors, general contractors, public officials spoke tributes to the kindness and public spirit of the Cohns. Seth Cohn himself recalled incidents in the horse and buggy days of the industry. He had worked in Reno and San Francisco for pioneer utility companies before starting his Atlas Electric Co. in San Mateo. The San Mateo Electric Club also honored him at its June 3 meeting, and the San Francisco Electric Club had made him an honorary life member on the 50th anniversary of his first start in the industry several years ago.

► **License fees** for electrical contractors in Rawlins, Wyo., were raised by the city council from $100 to $250, with a yearly renewal fee of $75.

## Council Decisions

Wage rates in Washington were in dispute but the Council on Industrial Relations for the Electrical Contracting Industry settled the issues at its last meeting. In a new one-year contract between Puget Sound Chapter, NECA, and IBEW Local 46, the rate went up 25c an hour to $3.65, plus fringes, making a total of $3.91. Fringes include 15c for vacation, 7½c for welfare, 3½c pension. The free travel zone was extended almost 10 miles south, nearly to Tacoma.

Tacoma contractors and IBEW have settled for an increase of 25c on July 1 and 5c more next January over the basic scale of $3.40. Wages in Bremerton and Everett increased 25c also from $3.80 and $3.87½ respectively. Everett has an eight-mile free travel zone around Everett and Mount Vernon. Bremerton contractors got a reduction of overtime on Fridays from double time to time and a half from 4:30 to 10 p.m.

Eastern Washington increases were also 25c an hour including fringes. This makes Spokane and Pasco scales $3.57½ and Wenatchee's $3.65. The apprenticeship training program was lengthened to five years.

## Still Negotiating

Los Angeles Chapter, NECA, and Local 11, IBEW, had not settled wage negotiations at press time although the termination date is June 30. However, both union and contractors had a joint golf tournament June 20, indicating friendly relations.

Karl W. Church, formerly on the labor relations staff at Boeing in Seattle, was appointed apprenticeship coordinator for the NECA chapter and union in Los Angeles, succeeding Gene Jones.

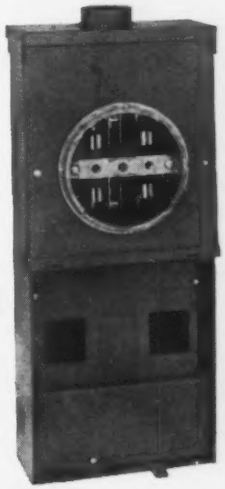
Directors of the chapter voted special commendations to Jack Rollins and his assistant, Roberta Morgan, for their work in staging the Tri-District NECA convention in May.

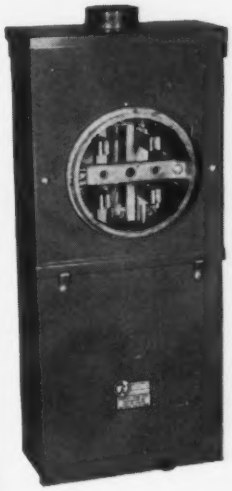
► **Salt Lake City, Boise and Pocatello** have just had estimating workshops similar to that so successfully conducted in Wichita by NECA. The Salt Lake sessions were held June 16-17, Boise June 19-20, Pocatello June 23-24.

► **San Leandro** has adopted the 1956 edition of the National Electrical Code and the East Bay Uniform Electrical Code, as of June 19.


THE WESTERN BRAND OF QUALITY presents a new product!

Combination 200 Amp. Meter Socket and Circuit Breaker Service Can . . . with 2-100 Amp. Magnetic Hydraulic Circuit Breaker 2 Pole.





Raintight Construction with 2" Hub and Sealing Ring

Meter Socket with Either Circuit Breaker or Fuse Pullout Combination . . . depending on size. (Not illustrated)

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# Association Affairs

## AIEE at Sacramento

The AIEE 1958 Pacific General Meeting, to be held in Sacramento, Calif., August 19-22, will headquarter at the Senator Hotel. Sacramento, which serves as the gateway to San Francisco, Lake Tahoe, Yosemite National Park and Reno, is expecting a large turnout of engineers and their families at the convention going to or from vacations.

To add interest to the technical sessions, the following inspection trips will be available:

**Aerojet General Corporation**—producers of equipment for Vanguard, Polaris, Bomarc and Regulus missiles.

**McClellan Air Force Base**—a major bulwark of our nation's West Coast defenses.

**Elverta and Hedge substations.**

**U. S. Army Signal Depot.**

**Proctor & Gamble plant.**

**Folsom Dam and power house**—the old and the new, showing the original Folsom power house equipment originally set in operation in 1895.

### Social Events

Early arrivals will enjoy a get-acquainted gathering from 7 p.m. to 10 p.m. on Monday evening, Aug. 18, in the Gold Room of the Hotel Senator. Additional social activities will include a get-acquainted coffee hour on Tuesday morning, the opportunity to take in "The Most Happy Fellow," Thursday's luncheon, and an authentic Hawaiian luau complete with hula girls, beach boys and native Hawaiian music.

To carry out the Hawaiian theme, there will be an eight-day post-meeting tour to the Hawaiian Islands, being made available by the committee.

The ladies' program includes coffee hours, teas, luncheon talks, field trips, brunches, swims and fashion shows.

And now for the clincher—provisions may be made for baby sitting and child care, as well as various forms of recreation available for children of all ages.

► Motor Shop Personals—Fred Scott, pioneer motor shop man of Seattle, with Industrial Service Co., once operator of his own Scott Electric Service Co. in Seattle, was honored at the NISA Silver Jubilee convention in New Orleans for more than 50 years in the industry. . . Also honored was George M. Forrest, owner of Quality Electric Co., in San Francisco. . . Carl L. Lundberg, Cascade Machinery Works, Seattle, was elected treasurer of NISA at the same convention.

**Central California Chapter, IAEI, delegation to the Nevada Chapter meeting at Elko: Clyde L. Smith, secretary; George W. Hayden, PG and E; Marvin Olsen, Incandescent Supply; Charles R. Pierce, chairman and Fresno chief inspector; Fred C. Hornig Jr., Sierra Electric Co. This chapter has made a phenomenal over-all growth this year**

## NAED

NAED members in Los Angeles will again sponsor a course in electrical supplies and codes for junior executives and salesmen. The first such course just completed with 30 receiving certificates on June 17; a similar course will begin in September. A limit of 50 will be enrolled at the Los Angeles Trade Technical Junior College.

To provide basic product knowledge and electric fundamentals, the class meets weekly. Fred Cooper, consulting engineer, was instructor for the first course. Bernie Mason, application engineer, Westinghouse Electric Corp., will run the second. More than 50 speakers drawn from the industry were drawn upon for the first and will assist with the second course.

► IES chapter and section officers of the South Pacific Region, both new and old, are being called together by Carlton Thompson, San Diego Gas & Electric Co., regional vice-president, for the second annual planning conference at Monterey, Calif., July 18. Last year Carlton called the first such meeting and to it much of the credit for the fine organization of the regional conference in San Diego as well as the smooth operation of all chapters and sections throughout the year was attributed. The agenda calls for a review of all IES activities, appointments to committees, operation procedures, the forthcoming IES National technical conference in San Francisco in 1959.

## Electric Club Officers

Electric Club of Los Angeles elected W. B. Meek, its first vice-president, Westinghouse Electric Supply Co., to the presidency of the club as it closed its 1957-58 season June 9. George N. Hawley, Southern California Edison Co., will be first vice-president; Ted M. Blakeslee, Department of Water & Power, second vice-president; Albert W. Tracy, Anaconda Wire & Cable Co., third vice-president; L. Dean Fowler, General Electric Co., secretary; O. J. Paul, Ralph M. Parsons Co., sergeant-at-arms.

**Meek**

# aluminum!

ATTC

Today, substations are demanding aluminum bus and connectors for greater economy. For 30 years Anderson Electric has pioneered research with aluminum. Our production is complete from ingot to finished product. Our quality control methods insure "high density" by eliminating "pin-hole gas porosity" in aluminum castings. Anderson, and only Anderson produces a complete line of substation connectors — for every job — in aluminum.

For full information and details about specific connectors, contact your nearest Anderson representative or write

ANDERSON ELECTRIC

ANDERSON ELECTRIC CORPORATION
Birmingham 1, Alabama.

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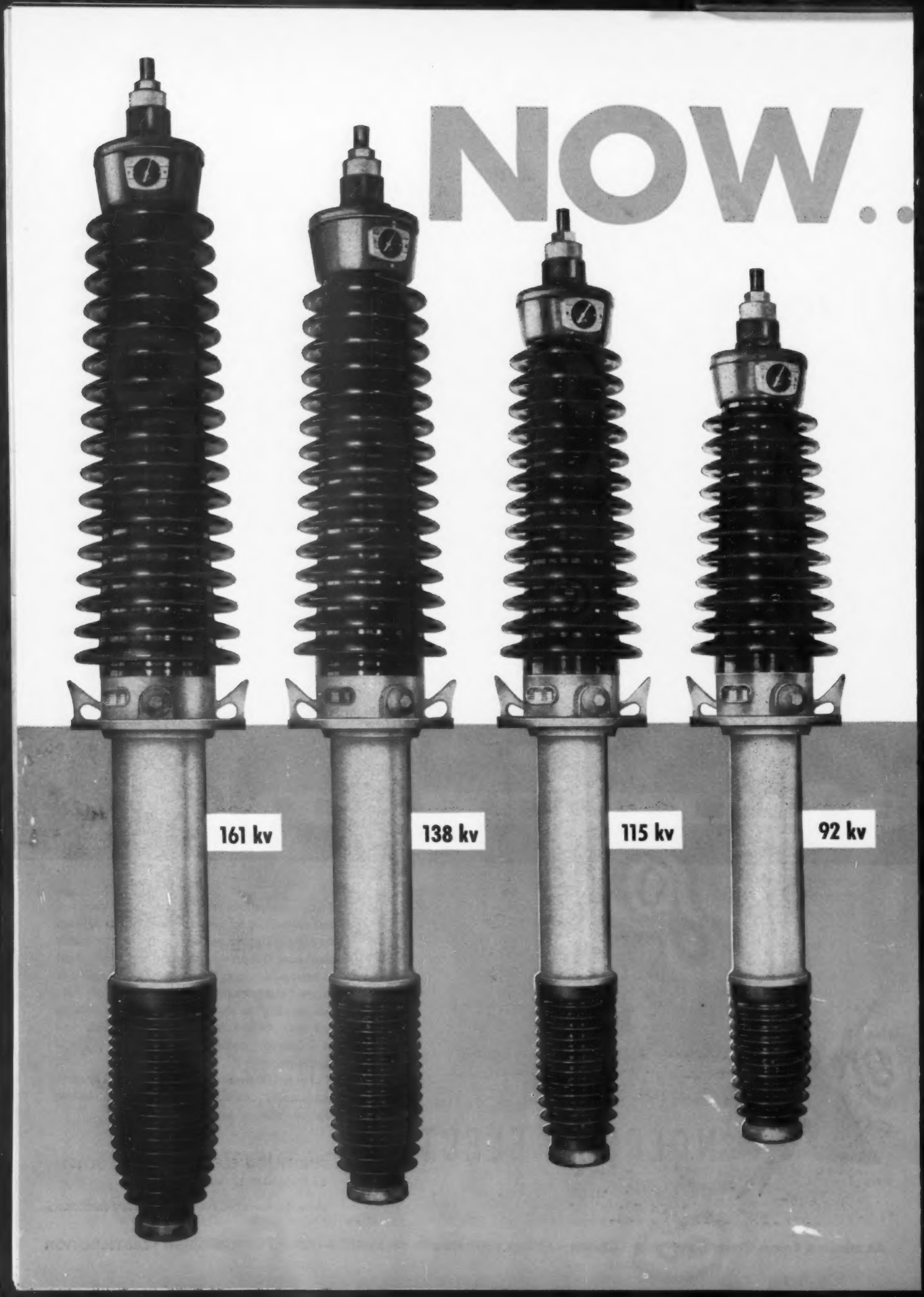
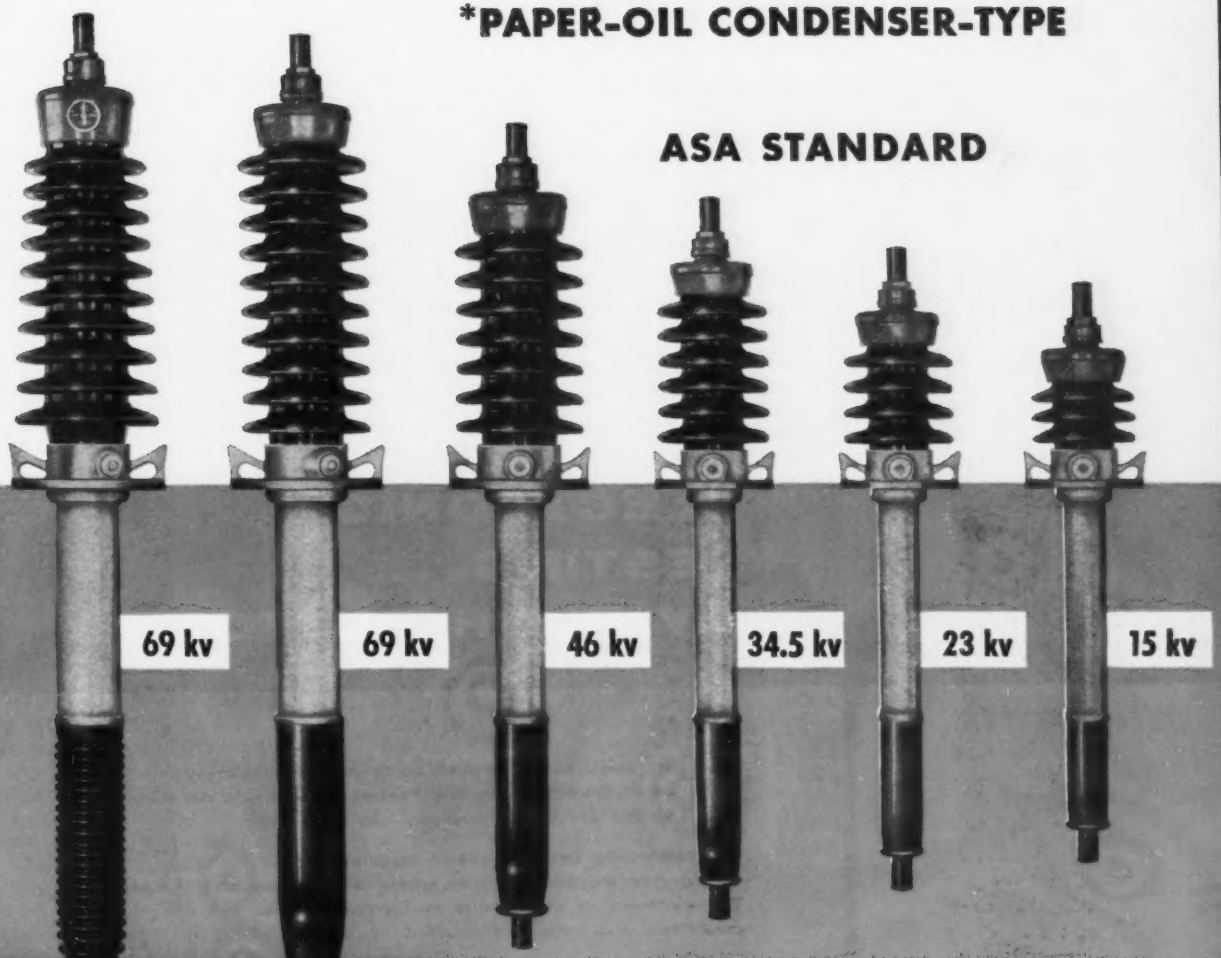
Aluminum & Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATION • TRANSMISSION • DISTRIBUTION


NOW...
161 kv
138 kv
115 kv
92 kv

# . . Lapp POC* Bushings
## in voltage ratings to 161 kv

*PAPER-OIL CONDENSER-TYPE

ASA STANDARD




**Lapp**

At every voltage rating from 15 kv up, Lapp POC* Bushings provide the operating security of totally-enclosed design... ...all exposed insulation is *porcelain.*

Lapp Insulator Co., Inc., Le Roy, N. Y.

WESTERN REPRESENTATIVES:

Los Angeles: Earl S. Condon Co.
San Francisco: C. E. Ingalls & Sons
Seattle: Charles F. James
Butte: R. E. McDonough Co.
Salt Lake City: Riter Engineering Co.

# ELECTRONIC TESTING... BY PUSH BUTTON!

*Patent applied for.*

Yes, just push a button and automatically, Moloney Distribution Transformers are Tested, Proved and on their way ... all neatly crated, of course ... to your utility.

Our automatic testing system, applied to our enlarged production facilities, guarantees production of Moloney Transformers of the quality you want, in the quantities and ratings you want.

Control room for the automatic test system contains equipment which automatically records test data for each transformer as it goes through the test area.

MESB-14

*Manufacturers of* MOLONEY ELECTRIC® *Transformers for Utilities, Industry and Electronic Applications*

SALES OFFICES IN ALL PRINCIPAL CITIES

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

# Market Development

**What sales power can do to push up the sales curve is told by O. R. Doerr, PG and E vice-president, at Fairmont Hotel breakfast that launched the Better Buy Now program. At table (from left) Philip Barber, H. R. Basford Co., vice-president of the San Francisco unit, NCEB; Harry Lee, PG and E; C. W. Goodwin, GESCO, NCEB president; W. L. Greer, PG and E; Wesley Lachman, Lachman Brothers, GAS vice-president; J. S. C. Ross, PG and E; Don Tobin, Sterling Furniture Co. During the drive it is Better Sell Now and . . .**

## Better Buy Now

Out to change soft to hard sell, Pacific Gas and Electric Co. is spearheading a Better Buy Now promotion on appliances, radio, TV and lighting. Sponsors are the Northern California Electrical Bureau and the Gas Appliance Society.

Launched at a breakfast given by PG and E for some 300 dealers and distributors in the San Francisco area, the program includes a big advertising and promotion program. PG and E is holding similar industry meetings throughout its system in support of the program and is furnishing dealer aids.

Dealers are asked to mark and return a check list containing 26 ways to increase sales and get the program rolling. Among them are: make 10 additional prospect calls per salesman per month through December; follow up on paid-up credit accounts; use the user for leads; offer service check-ups to uncover leads; follow up on new homes and older homes purchased; offer premiums and home demonstrations; stress credit sales; offer deferred down payments; put on live in-store demonstrations; hire more sales people, fix up window and store displays; stay open nights.

► The **Reddy Reporter** is the name of a new dealer promotional tabloid published in April for the first time by Idaho Power Co. The first issue, handsomely printed in lithography, is well illustrated and features many dealers and contractors as well as outlining the company's range and water heater program with a goal of 4,213 units. It is distributed free to dealers, contractors, plumbers, builders, architects and distributors and, according to Al Gilbert, general sales manager, will be issued quarterly. Vic Goertzen is its managing editor.

## Utilities Team Up On Promotion

Southern California Edison and California Electric Power companies are joining in a cooperative effort to promote electric heat pumps.

A series of open houses will demonstrate flameless, fuelless air conditioning to builders, architects, planners, realtors and contractors. Each utility will conduct its own campaign but wherever a combined open house is feasible they will split the cost.

► Plans are being worked out for an **October range campaign** by Southern California Edison, Los Angeles Department of Water & Power and all major electric range distributors. Electric League of Los Angeles will be the coordinator.

► The Portland territory gets a new industry in the form of a warehouse-distribution facility of the A. C. Horn Co., a subsidiary of Sun Chemical Corp. This firm manufactures specialty building products including waterproofings, floor treatments, special paints and calking compounds, including new rubber calking material. This is the Horn company's third plant on the West Coast, the other two being in California. The Portland plant will be sales headquarters and shipping point for Oregon, Washington, northern Idaho and western Montana.

## About Sales People

► **Robert E. Savre** has been named Pacific Coast regional manager of the Westinghouse portable appliance division, with headquarters at the Western Merchandise Mart, San Francisco. He joined the company in 1956 in Phoenix and recently has been at Los Angeles.

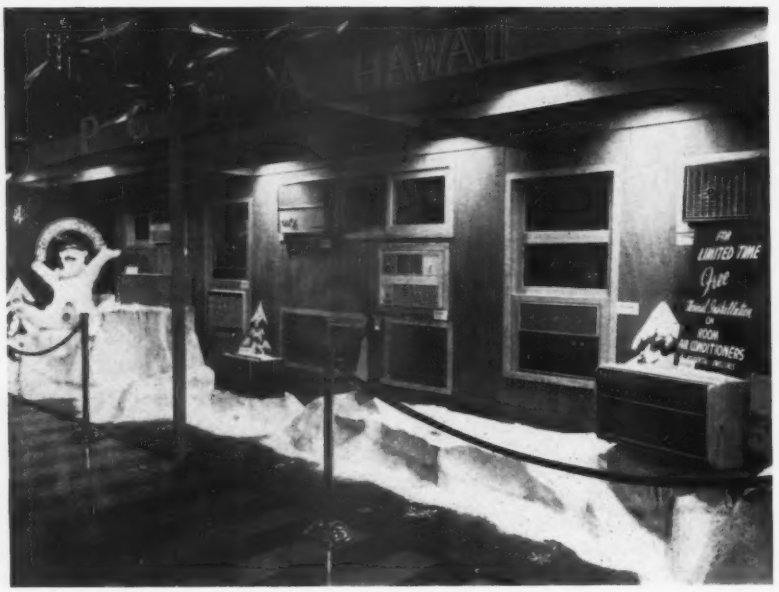
► Sues, Young & Brown has appointed **E. J. Dymek** as vice-president in charge of sales. Dymek spent nine years with Douglas Aircraft in personnel and industrial relations before he started on the SY&B order desk. Most recently he has been general merchandising manager for the distributor.

► Honolulu Electrical Products Co. has announced three executive appointments. **Kingsley Jones,** formerly with American Can in Hawaii, has returned to the Islands as treasurer and controller of Hepco, succeeding **D. S. Lennox,** vice-president and treasurer, who resigned. **Harold E. Silvernail** was named sales manager of the Hotpoint division and **Charles W. Shafer** will head the Westinghouse division.

► Graybar has announced appointments at Los Angeles and San Francisco. **E. W. Bonnet** is being promoted to district appliance sales manager at Los Angeles, effective June 1, and **W. H. Huffman** will take over as manager of the housewares section there. **W. H. Mayben** has been transferred from Louisville as San Francisco district appliance sales manager.

► **Jeff Geoffroy** has been made manager of the new builder sales department of Electrical Distributors Ltd., RCA Whirlpool distributor in Hawaii.

► **Ernest Mortensen,** most recently manager of Packard-Bell's Albuquerque office, will head up a new regional sales headquarters established in Dallas.




**PCEA Hawaii launched its air conditioning promotion with this exhibit at the second annual Home Show in May. A happy polar bear at ease on a snow bank pointed up the cooling qualities of this equipment. On the spot sales were made**

## Home of the Future

Hawaii's second annual Home Show opened at the Kaiser Aluminum Dome on Friday evening, May 23, and was visited by 18,000 before it closed on May 27. It was held over for two days by popular demand.

There were 44 booths on the main floor and nine in the balcony. Diversification of exhibits was the keynote this year. From building materials to landscaping, from power tools to swimming pools—all were represented in attractive displays. The latest in all-electric kitchens was shown by several exhibitors to interested crowds. And the electronic range drew people from all parts of the show during demonstrations by HECO Home Service girls.

Pacific Coast Electrical Assn. (Hawaii) was represented by a three-booth display featuring room air conditioners. Eleven different brands were shown, seven being in actual window or through-the-wall installations while the remaining four rested on a snow bank. A representative from HECO was present at all times as were distributor sales personnel.

The air conditioning exhibit introduced the current PCEA promotional offering free normal installation for room air conditioners during June, July, August, September.

► **Colorado dealers** have sold 528,871 TV receivers since television became available in the area in 1952. A study by the Rocky Mountain Electrical League showed sales for January through April this year of 22,706 sets, comparing favorably with 1957, when 73,814 were sold for the 12 months. Ralph Hubbard, RMEL manager, reports that there have been 2,261 color receivers sold, 348 of them in 1958.

## Cash for Replacements

Tacoma's public utility board has approved renewal of a residential power up program that last year netted $211,000 for appliance dealers, electricians and plumbers.

Under the plan Tacoma City Light pays $20 for replacement of a gas, wood or oil range or water heater by an automatic electric appliance, and $20 for replacement of a side-arm water heater. When both range and water heater are replaced, the payment jumps to $50.

► **Seattle City Light** appliance servicemen are going to cooking school to learn how to use accessories featured on the new ranges. A two-hour class is conducted by Mary Norris, utility home economist, and there is a final exam—eating the food.

► **Reddy Kilowatt** is starring in a TV spot series previewed last month at the Pittsburgh convention of the Public Utilities Advertising Assn. Reddy also has a new address—750 Third Ave., New York 17.

## Training Center Opened

New service training facilities for Frigidaire dealers in the Oakland area were opened June 16 at the General Motors training center in San Leandro, with some 200 company dealers attending the dedication ceremonies.

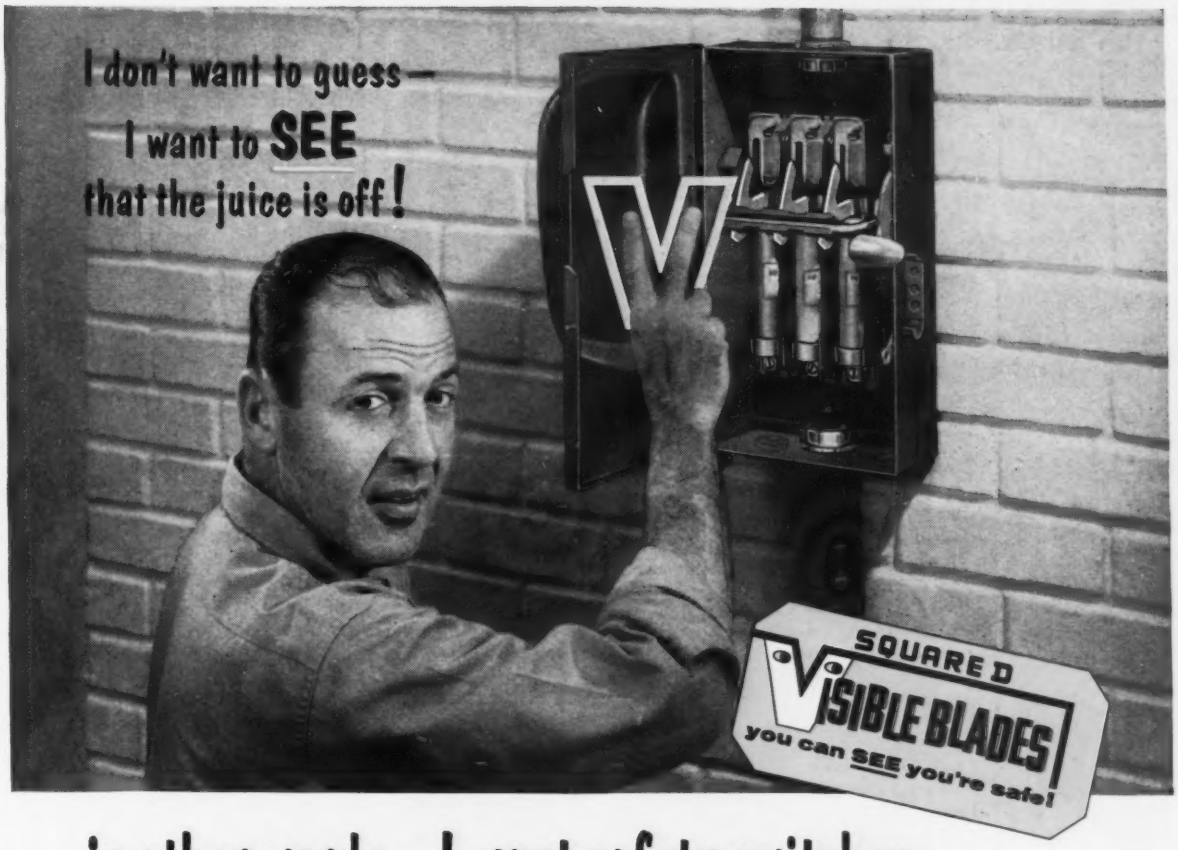
Principal speaker was E. E. Landis of Dayton, factory service manager, who gave facts to prove that service builds sales. Others participating were Lee Caldwell, manager of GM training center, and E. A. Holmes, Oakland branch service manager.

According to W. F. Cronin, manager of the Oakland branch, Frigidaire's new local service center is the 19th of 30 such company schools. Approximately 2,300 sq ft of space at the San Leandro center have been made available to accommodate the area service training program, he said. Donald F. Allex was transferred from the Denver training center as instructor.

Equipped with complete shop facilities, the section provides factory training for dealers, as well as servicemen employed by national users of Frigidaire products and independent service organizations. Upon completion of the course, a serviceman will be awarded a certificate.

► More than 320,000 TV sets were delivered in the Los Angeles signal area last year, according to the annual report made by Glen Logan, managing director of the Electric League. During December the total number of sets in the area crossed the three-million mark, he said. Included are 11,076 color sets. Radio sales in the area were up 9% for the year, with 416,134 sets distributed.

**NEW LOOK IN LIGHT BULBS—A basic design change in the Westinghouse household light bulb gives greater surface area with same outer dimensions; permits more silica coating on the inside, according to F. M. Sloan, vice-president. A new process coats the cylindrical bulb interior with millions of special glare-deflecting particles. Called the Eye Saving White Bulb, the lamp ties in with the Shape of Tomorrow program**




# ...in other words—I want safety switches with VISIBLE BLADES!

The men who pull the switches will tell you what can happen when a switch, *believed* to be open—*isn't.* A lot of things can happen—and every one of them is bad. Personnel is in danger. Motors can single-phase. Machinery and work can be damaged. Down-time can skyrocket.

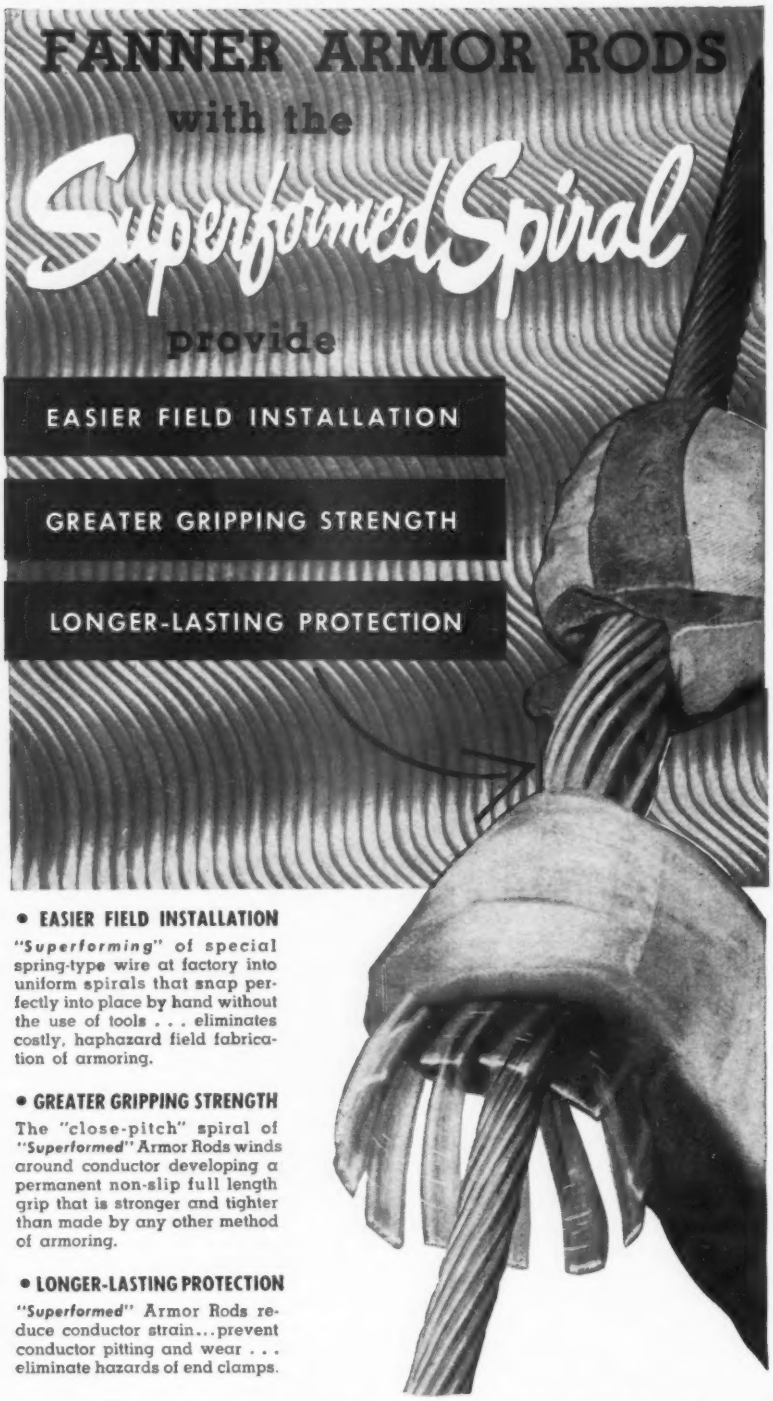
Doesn't it make sense to insist on Visible Blade construction which gives you a road block against any of these possibilities? Doesn't it make equally good sense to insist on the safety switch which gives you that construction—plus a lot of other performance advantages?

**100,000-ampere SHORT CIRCUIT Capacity —*Another Plus Feature***

Square D safety switches equipped with high capacity current limiting fuses provide full protection on even the highest electrical loads. Independent tests by a high capacity laboratory on Square D safety switches — rated at 30 through 600 amperes—subjected the switches to both open and closed tests on 100,000 ampere short-circuited systems. *Not one Square D switch showed any sign of failure!* Further proof that Square D switches provide *plus* safety. They cost no more—why settle for less?

**EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE**

**SQUARE D COMPANY**




• **EASIER FIELD INSTALLATION**

"*Superforming*" of special spring-type wire at factory into uniform spirals that snap perfectly into place by hand without the use of tools . . . eliminates costly, haphazard field fabrication of armoring.

• **GREATER GRIPPING STRENGTH**

The "close-pitch" spiral of "*Superformed*" Armor Rods winds around conductor developing a permanent non-slip full length grip that is stronger and tighter than made by any other method of armoring.

• **LONGER-LASTING PROTECTION**

"*Superformed*" Armor Rods reduce conductor strain...prevent conductor pitting and wear . . . eliminate hazards of end clamps.

To get the best — specify Fanner "*Superformed*" Armor Rods. Get acquainted with the important savings they offer by writing for descriptive literature today.

CENTER-MARKED, COLOR CODED AND PACKED IN CONVENIENT CARTONS

Licensed for use under patent Nos. 2,275,019 and 2,587,521

Fine Fanner Superformed Products

**THE FANNER MANUFACTURING COMPANY**

Electrical Products Division

BROOKSIDE PARK • *Established 1894* • CLEVELAND 9, OHIO

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ARMOR RODS · LINEGUARDS · TAP ARMOR · PATCH RODS · FANNGRIPS
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# People

## New GESCO Head in Seattle

R. P. Moser has been appointed manager of the General Electric Supply Co. operations in Seattle, succeeding J. P. Hubenthal, who retired at the end of May. A graduate of Oregon State College, "Bob" has been affiliated with various G-E operations.

Moser

He started with the Lamp Division, first at Nela Park, then at the Pittsburgh sales office. Transferring to GESCO in Pittsburgh, he spent four years with the Supply company before he returned to the Lamp Division at Spokane.

Following service in the Air Force during World War II, he joined the Apparatus Sales Division, Pacific Northwest district, where he held assignments in advertising and sales promotion.

Succeeding Moser as manager of distribution sales is R. B. Temple, with the firm for 18 years, the past three years as manager of specialty sales.

Hubenthal, who served G-E for 30 years, has purchased a hardware store in Seattle at 8343 15th Ave., N. W., and is operating it under the name of Bert's Hardware.

► **D. S. Clasen** and **John T. Sampson** were recently named to sales posts in Allis-Chalmers' Western sales offices. Clasen was appointed sales representative for the San Francisco district office, and Sampson as a general products sales representative for the Los Angeles district office. Both men recently completed the company's graduate training course at the West Allis Works. **Grady Laxson** becomes a general product sales representative for the Phoenix office.

► **John Read** has joined the southern California construction materials division of General Electric as a district representative.

► **A. Frank Ayres** has the new title of engineering executive assistant for California Electric Power Co. New duties involve coordination of design of power generating stations and of power pooling agreements and contracts.

*Original "straight-through" design*

# This "look" on a pole means KPF

There's no mistaking the clean, pleasing pole top appearance of KPF switches—the original "straight-through" design. This design means lower cost, trouble-free service, no lubrication, virtually no maintenance. Installation may be made in the air or on the ground, on hot or dead lines, with phase units in horizontal, triangular or vertical array. Installation time is half that normally needed; no extra dead end insulators or heavy extra mounting structures are required.

Test install a KPF switch on your system this month.




**KPF ELECTRIC COMPANY**
Dept. W, 1624 E. Alpine Avenue
Stockton 5, California

► **Bernard J. Geerling** has been named sales manager, and **Donald L. Sanders** controller of Day-Brite Lighting Inc. of California. The promotions followed the appointment of **Stanley M. Bixler** as senior vice-president and general manager of Day-Brite's national operations.

► **James D. Willson** has been elected a vice-president of Norris-Thermador Corp. in Los Angeles. He was most recently vice-president of finance for O. A. Sutton Corp., Wichita.

► **Arthur Munroe** and **Tom Shoemaker** are new members of the sales staff of Thomas & Betts Co. in Los Angeles.

► **Al Thompson** is new sales representative for Prescolite Mfg. Co. in the Colorado-Wyoming territory. He moves from the home office in Berkeley. Thompson is a native of Colorado, and attended West Denver High School and the University of Wisconsin. He is a member of the Illuminating Engineering Society, East Bay Electric Club and Home Lighting Committee of PCEA.

Thompson

► **Irvine A. Hill** has been appointed chief cable design engineer of Western Insulated Wire Co. Hill has served as cable engineer for Simplex Wire & Cable Co., and as product engineer for Paranite Wire & Cable.

► **Louis G. Puls** has been named designing engineer for USBR at Denver, succeeding **Kenneth B. Keener,** retired after 47 years of service. Puls had been assistant chief designing engineer since 1956 and previously was head of the concrete dams section. He started with the bureau in 1933 as concrete dams designer. Prior to that he was employed by Corps of Engineers on flood studies and by private engineering firms on construction of water supply works and dams. From 1928 to 1932 he was field engineer on construction of Russia's Dnieprostroy Dam and power plant.

► **L. J. Baudino** has been named vice-president and general manager of Western Colorado Power Co. to succeed **J. A. Bullock,** who has been general manager since 1937, and who will retire to live in Provo, Utah, his birthplace. Bullock has been with the utility business since 1909 when he joined the Telluride Power Co.

► **John Bankus** has retired as chief engineer for Portland General Electric Co. after nearly 40 years with the utility. Bankus joined PGE as a wireman shortly after his graduation from the University of California with a degree in electrical engineering. He became assistant chief engineer in 1935 and chief engineer in 1943. He is a fellow of the American Society of Electrical Engineers.

Bankus

## PG and E Promotions

Earl E. Foley has been promoted to manager of the Fresno district of Pacific Gas and Electric Co. He succeeds Vern C. Redman, who continues with his duties as assistant division manager.

Promotion of Ira J. Chinn from manager of the San Joaquin Division general services department to manager of the division personnel department, to succeed Foley, was also announced.

W. Lyman Harris takes Chinn's place in the general services department.

► Roy F. Carter has been appointed sales engineer for the air conditioning division of Westinghouse Electric Corp., with headquarters in Fresno. His territory will include Bakersfield, the San Joaquin Valley and the northern Sacramento Valley.

► **Lawrence R. Hennings** is now a member of the Seattle sales office of Rome Cable Corp. He was formerly with John A. Roebling Sons Corp.

► **Gordon McCampbell** is a new sales representative of Prescolite Mfg. Co. for the San Francisco-Oakland Bay area.

► Armor B. Martin, research consultant for Washington Water Power Co., was made an assistant vice-president following approval by shareholders of WWP acquisition of the Spokane Natural Gas Co. Martin was with Montana Power Co. for more than 20 years, part of the time as manager of gas operations and finally as chief engineer. Since his affiliation with WWP in 1953, he has had many special assignments, including that of management coordinator for the Pacific Northwest Power Co. With his new responsibilities in the company's gas and electric operations, he will be relieved of most of his duties with PNP, according to Kinsey M. Robinson, WWP president.

► **Vane R. Wilder** has been made assistant power superintendent for Pacific Power & Light Co.'s Merwin, Yale and Swift hydro projects on the Lewis River. He had been power superintendent in the Walla Walla district.

► **L. J. Richardson,** chairman of the Chelan County PUD of Wenatchee and a board member for 16 years, was named chairman of the Puget Sound Utilities Council.

► Appointment of **Maurice F. La Brie** as sales manager of mechanical products for the Sunnyvale manufacturing division of Westinghouse was announced by James S. Hagan, manager. La Brie succeeds **John S. Langwill.**

► **Robert L. Hubbert** has been appointed Pacific Coast regional manager of accounting for Westinghouse Electric Corp., with headquarters at Sunnyvale. **James J. Beitler,** who has held the position since 1942, will be an adviser.

► **Brian J. Sturman Jr.** has been named manager of the Westinghouse manufacturing and repair plant at Compton, Calif., replacing **Frank H. Robb,** retired.

► Two employees of Portland District, Corps of Engineers, retired May 31 with services totaling 59 years. They are **Frank E. Driscoll,** general construction inspector at The Dalles Dam resident office, 36 years, and **George B. Faris,** assistant chief of the drafting section at Portland, 23 years.

► **Alan V. Carlson,** former rate engineer for Washington Water Power, has been made manager of commercial and industrial sales in the utility's Spokane division, succeeding the late William A. Newman. He joined WWP in 1954 as an industrial engineer, following service for a Portland contractor and with Portland General Electric Co.

► **M. C. Larson** has succeeded **C. M. McElroy** as Cutler-Hammer district manager at Denver. McElroy was transferred to San Francisco as manager. Larson formerly managed the Baltimore branch.

No. 7 in a series

# Right off the Wire

An application of television shows a pilot the image of his plane superimposed on a map of the territory over which he is flying.

An X-ray inspection method for solid cast rocket fuels reveals any cavities or fissures that would interfere with burning.

A new machine at Simplex applies Condex Interlocked Armor over cable cores having diameters up to 4.5".

An electronic guidance system will help river pilots to maneuver long strings of barges around the bends and under the bridges of the Mississippi.

A new facility for advanced research in thermonuclear reactions is expected to generate temperatures in the millions of degrees.

A land-mine exploder has been developed by the Army which will detonate buried explosives without damage to the exploder or the tank that carries it.

A new alkaline flashlight battery is said to last ten times as long as ordinary dry cells and to deliver more power.

A generator-powered flash-bulb holder is about the size of an electric razor. Half a turn of a wheel stores enough electricity in a capacitor to fire the bulb.

A television tube only five inches thick has been developed in England.

A process has been developed for electroplating copper on aluminum. The plating can be tinned, soldered or formed.

A new synthetic rubber is resistant to oils, fuels and solvents and retains its properties at temperatures as high as 400°F.

A new chemical compound slows the growth of any part of a tree without affecting the rest.

A new electronic instrument analyzes the sequence of chemical reactions in the burning of rocket fuels in one ten-thousandth of a second.

A single relay system across Canada from Halifax to Victoria will carry television programs and telephone conversations.

The floodlights at Niagara Falls have been redesigned to give ten times the illumination of the former twenty-five-year-old system with no increase in power consumption.

**Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.**

Among the United States exhibits at Brussels will be an outline of world history for the entire Christian era stored in a computer. Any item can be found in two-thirds of a second and printed in any one of ten languages.

The first digital computer fast enough to evaluate the performance of a missile in flight is said to be twenty-four times faster than preceding models.

A new X-ray technique reduces radiation exposure to a fraction of that now used for diagnosis.

A new truck transmission has twelve speeds in one gear box controlled by one lever.

A new machine can weigh and sort coins at the rate of 18,000 per hour with an accuracy of plus or minus one-fourth of one per cent.

A new desk-top machine covers one or both sides of documents with clear plastic film.

A device for practice in marksmanship shoots, instead of a bullet, a flash of light, which shows on the target.

An ultra-sensitive space speedometer measures acceleration in any direction.

## A Simplex Laboratory

At the Simplex plant in Cambridge, six modern, well-equipped laboratories similar to the one shown here are devoted to the never-ending search for new, better materials and methods which result in new, better wire and cable products. Over the years, this program of concentrated, intensive research has brought about a great number of the most important technical advances and product improvements that have made Simplex the leader in the wire and cable industry.

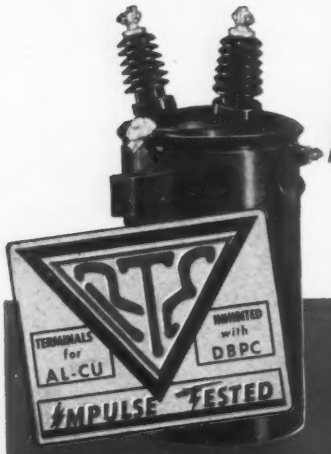
**SIMPLEX WIRE & CABLE CO.**
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

*Highest quality cables for:* Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

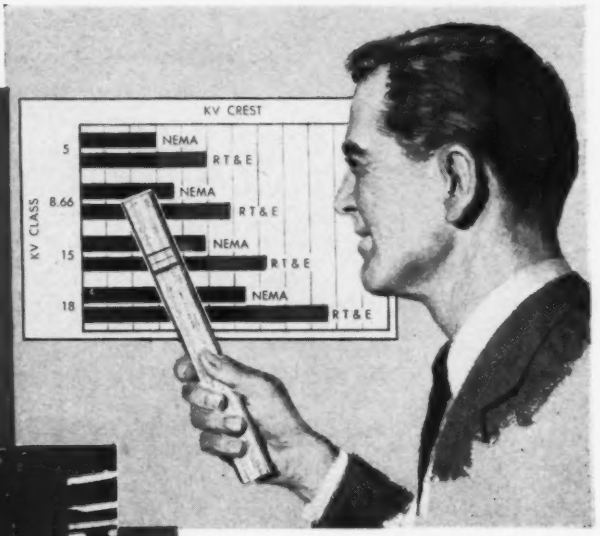
*"The American manufacturers of transoceanic telephone cables"*

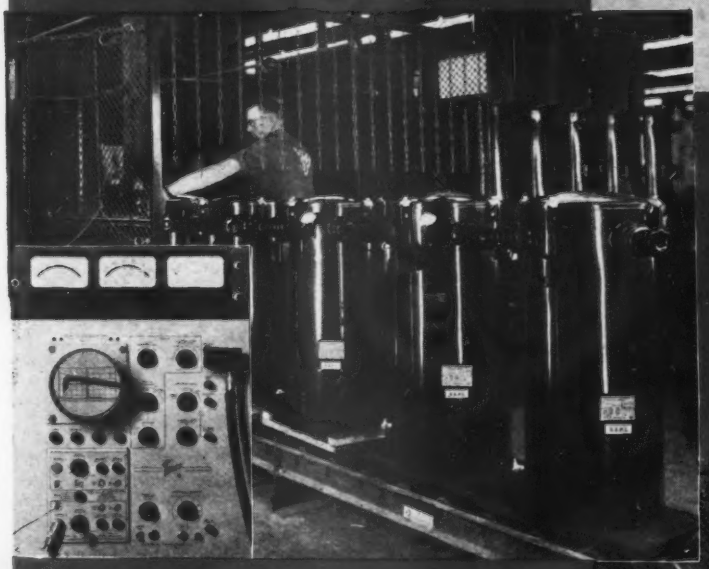
# IMPULSE TESTED




## DESIGN

High impulse strength in transformers is not attained by accident; it must be considered from the very beginning of design. Such is the case at R T & E, where transformer design is based on impulse withstand levels approximately 50% in excess of NEMA standards.



## TESTING

Every R T & E Transformer receives an "on the line impulse test" through use of the most modern equipment and methods known. This test not only insures that the transformer meets NEMA impulse level requirements but also rejects those transformers that are not of maximum quality.

## OPERATION

Naturally, the ultimate in testing is provided "on the system", where nature subjects the transformer to the most rigorous tests. R T & E Transformers have been thoroughly proven in operation in every climate of the U. S. They have been awarded the invisible seal of customer satisfaction, proved by a growing list of customers who specify R T & E.

R T & E CORPORATION
WAUKESHA, WISCONSIN
*Helping provide power for America*

► **George N. Robinson,** 83, Colorado pioneer electrical engineer, died May 18 in Redlands, Calif., where he had lived in retirement the past 15 years. He suffered from a heart ailment. During nearly a half century with the Western division of General Electric Co. he played an important role in bringing electrical power to all of Colorado. He went to Colorado first in 1901 to work with Thomas Edison in stringing the West's first long-distance high voltage line. It ran through mountains from Telluride to Ouray and the power it delivered was used to electrify the Ouray Hotel, a famous early day hotel. He spent several years with G-E at Schenectady, N. Y., before moving to Denver in 1905 to help open the company's Western division office.

► His host of friends in the electrical industry will regret the sudden death of **W. V. "Pat" O'Brien.** He had been a recent speaker at both the PCEA and NELPA annual meetings. A tireless worker and broad influence for good in the affairs of the industry, he has been struggling with poor health for several years.

► **Robert Hudson,** consulting electrical engineer, died in San Francisco, May 13. He had at one time been associated with the late Tom Hunter as Hunter & Hudson and designed the electrical systems for many California buildings.

► **Selden I. Clawson,** aged 95, who directed the installation of the first electric lights in the Salt Lake Tabernacle, died May 21.

► **James G. Reed,** a charter member of the Los Angeles Electric Club and formerly connected with General Electric Supply Co. in Los Angeles, died recently.

► **George E. Fletcher,** 53, founder and president of Columbia Electric Mfg. Co., San Francisco manufacturer of power distribution equipment, died June 8 at his home in Atherton, Calif. An electrical engineering graduate of the University of Santa Clara, he was a sales engineer for Westinghouse Electric Corp. before he organized his own firm about 15 years ago.

► **Richard A. Church,** 60, power dispatcher for Puget Sound Power & Light Co., died recently at Seattle, Wash. He had been with the company since 1924. For many years, he was treasurer of the Electric Club of Washington.

# Manufacturers—Distributors

**Model towers of G-E's extra-high-voltage line near Pittsfield, Mass.—which will carry power at a maximum of 750,000 v—dwarf a 110,000-v transmission line tower built to same scale, to attain supervoltages never used before for transmission**

## Project EHV

General Electric Co. has announced plans to transmit electric power at supervoltages—perhaps as high as a million volts!

The G-E line will be energized at 460,000 to 500,000 in its first year of operation and at 600,000 to 750,000 v in its second and third years. Dependent upon further consideration at that time, the line may be reconstructed and the voltage raised to hit the million mark.

European countries, notably Sweden, Russia, Germany and France, are operating lines at 400,000 v and planning others at higher levels.

Called Project EHV (Extra High Voltage), the G-E line will be built next year near Pittsfield, Mass., headquarters of the company's power transformer department, which is coordinating the project. It will be 4½ miles long.

The project will cost more than $5,000,000 in funds, equipment and engineering talent contributed by 15 operating departments of General Electric and four cooperating companies, with guidance from an advisory council representing the electric utility industry.

Participating companies include Western Massachusetts Electric Co., which will later take over and operate the EHV line as part of its transmission system; Aluminum Co. of America, which will supply the steel-reinforced aluminum conductors that carry the power, also conductor accessories; and a supplier of steel towers. Also participating is Stone & Webster Engineering Corp., which is surveying the right-of-way, designing the line in collaboration with G-E engineers, and will be in charge of constructing the project.

"The entire electrical power industry will benefit from this project," said Dr. Pier A. Abetti, manager of systems research for G-E's power transformer department, who is in over-all charge of the project. "We hope to be able to solve in advance many of the problems that could impede the progress of utilities in this field. The next higher step from the present 345-kv transmission will be in the order of 460-kv, which we should have operating in America in the next few years."

Project EHV will help fill the need for new and wider technology in extra-high-voltage, and will help re-establish the United States as a world leader in the extra-high-voltage field, he said.

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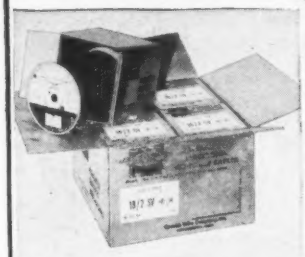
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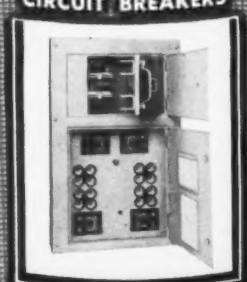
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## Westerners Win Awards

Four Westerners were among electrical distributors receiving merchandising awards at the first annual Thomas Industries Achievement Award breakfast in San Francisco June 9 during the NAED convention.

Frederick Keller, company president, presented plaques for cooperation in getting home lighting fixtures from the manufacturer to the consumer. Westerners receiving them were: Irving P. Bean, Bean Electric Co., Seattle; Ira M. Beck, Central Electric Supply, Denver; Joseph McNamee, Incandescent Supply, San Francisco; F. A. Frankhauser, International General Electric Co., San Francisco.

E. Allen Lea, Moe Light Division sales manager, reported on the company's current Certified Inspiration Lighting program, designed to provide sales tools for home lighting.

## Office Opened at Los Angeles

Allen-Bradley Co. opened a new Los Angeles district office last month, occupying the quarters of the H. D. Esterbrook Co. at 1264 S. Boyle Ave. H. D. Esterbrook, who had served as representative for Allen-Bradley since 1947, has retired.

The new office will be headed by Frank J. Connolly, who was transferred from the New York district. Others on the staff are Frank L. Koenig, field engineer, and Robert H. White, distributor sales.

► **W. B. "Duke" Imholt,** for many years manager of Electric Corp. of San Francisco, recently merged with Phillips & Edwards Electric Corp., resigned in June to form his own agency, W. B. Imholt Co., at 275 Brannan St., San Francisco. He handles the Naragansett line of wire.

► A modern facility for Arrow-Hart & Hegeman Electric Co. at Los Angeles is in the design stage. It will have 10,000 sq ft of warehouse and 1,660 sq ft of office space.

► Hawaii has been added to Hallicrafters Co. territory of the **William J. Purdy Sales Co.** of San Francisco.

► Addition of two lines has been announced by **Kenneth Anderson,** Los Angeles manufacturers' representative: portable lamps and other specialties of the Daniel Woodhead Co. of Chicago and Steelduct Co.'s conduit and EMT.

## High-Voltage Lab

Hubbard & Co. will formally open its new Research facility on July 22. Located on a seven-acre tract in McCook, Ill., the laboratory is equipped to produce virtually every type of transient over-voltage and over-current disturbance occurring on an actual system.

Major laboratory high-voltage equipment includes a 3,200,000-v lightning generator, an 80-kw-sec, 100-kv surge current lightning generator, 600-kv, 60-cycle high-voltage test set and 60-cycle short-circuit testing equipment. The 3,200,000-v unit is capable of creating a sparkover across a 17-ft air gap.

High power testing will be conducted at a specially designed power laboratory adjacent to the main building, where power is available in a wide range of voltages and currents.

► **Bill Hill,** member of the electrical industry for more than 25 years, has started his own business at 805 E. Eighth St. in Los Angeles. Bill Hill Electric will specialize in all types of electrical work, motors and construction.

► **U. S. Electrical** Motors has established a district office at 40 W. 49th Ave. in Denver to serve its Rocky Mountain operations. Paul Cornell was transferred from the Los Angeles headquarters to take charge.

► **Harry F. Ream Sales** Agency of Denver has been appointed representative for Hampden Engineering Co., East Long Meadow, Mass.

► **Everett T. Vonier** Inc., Denver, is showing an expanded line of power circuit dry type, high temperature (150 C) transformers developed by Jefferson Electric Co., Chicago. Bert Farrell, sales manager for Jefferson, visited the region to introduce the new equipment.

► **Electric Corp. of California** has formed a new division, the Electric Corp. at Lancaster, the second such expansion within a year. The Lancaster division is the successor to the business formerly conducted as Cal-State Electric Supply. Merle Potter, who was president of Cal-State, will be an officer and manager of the new corporation. The move will now make available locally such additional lines as Allen-Bradley motor controls, Westinghouse apparatus and supply lines, Crouse-Hinds Condulets and Hubbell Twist-lock.


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HILL 2000 KVA power transformer (13.2 to 2.4 kilovolt delta) loaded for shipment to White Bluff Pumping Plant No. 1, Columbia Basin Project, Washington. Ordered through electrical wholesaler for the Bureau of Reclamation.

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**Anderson's Electric Corp.'s long-span testing machine is inspected by representatives attending the recent sales meeting at Birmingham, Ala. One of a very few such installations in the U. S., this machine is used to test clamps and connectors for mechanical strength. It can accommodate spans up to 50 ft and has a load capacity of 50,000 lb. Westerners at meeting: Hugh James, Western regional sales manager (fourth from left, front row); Frank Edin, Harold Klingenberg, Vernon Carr, Jim Wrathall, Bud Silver**

► **Rutkin Electrical Sales Co.** has opened a branch at Phoenix, with Ray Wendling in charge. The company also plans further remodeling in its recently acquired Los Angeles headquarters, 744 Kohler St.

► A California subsidiary has been established by **Unistrut Products** Co. at Berkeley. One of two company-owned subsidiaries in the United States, the California company formerly operated as an independently owned distributorship. Ralph F. Butler, Unistrut executive vice-president, in San Francisco last month, said that the West Coast now accounts for 30% of the company's sales. George T. McKay is manager of Unistrut Northern California, located at 2547 Ninth St., Berkeley 10. The company has distributorships at Sacramento, Portland, Seattle and Los Angeles.

► A new trademark—a bright red and black stylized shield—has been adopted by **Bryant Electric Co.**

► **Cochrane - Barron** Co. has been made sales agent for William Brand & Co. in southern California, Arizona, New Mexico and Nevada. Headquarters are at 544 S. Mariposa Ave., Los Angeles.

► **Electro Lighting** Corp. is the new name of Electro Silv-A-Corp.

► **Yuba Consolidated Industries** Inc., manufacturer of heat exchangers, condensers, feedwater heaters and evaporators, has acquired its eighth new firm within a year and a half. In taking over Judson Pacific-Murphy Corp. of Emeryville, Calif., for $3,500,000, it adds the largest independent structural steel fabricator in the West to its operations.

► Groundbreaking ceremonies were held recently for the million-dollar plant being built by **General Electric's Computer** department at Phoenix. Speaking at the ceremonies, which launched Operation Upturn, General Manager H. R. Oldfield Jr. said the department will continue to expand this year, adding perhaps 100 or more to its pay roll, now including some 800.

► Purchase by the Hein - Werner Corp. of Waukesha, Wis., of **Tal Bending Equipment** Inc. of Milwaukee and transfer of operations to Waukesha was announced recently. E. T. Tal will remain as a consultant in the pipe bending business.

► **Industrial Engineering & Equipment** Corp. has moved from the Subway Terminal Building in Los Angeles to 2975 Wilshire Blvd., according to Albert W. Jensen, vice-president.

► **Thomas & Betts,** Elizabeth, N. J., has acquired the **Kent Mfg.** Corp of Newton, Mass., maker of electrical terminals in continuous strip form and attaching machines. Marketing of Kent products will be by a division of the T&B sales department through wholesalers.

# TOUGH!

Husky Herman is getting nowhere fast. He ought to know it takes a lot of doing to damage one of VICTOR'S Apparatus Insulators!

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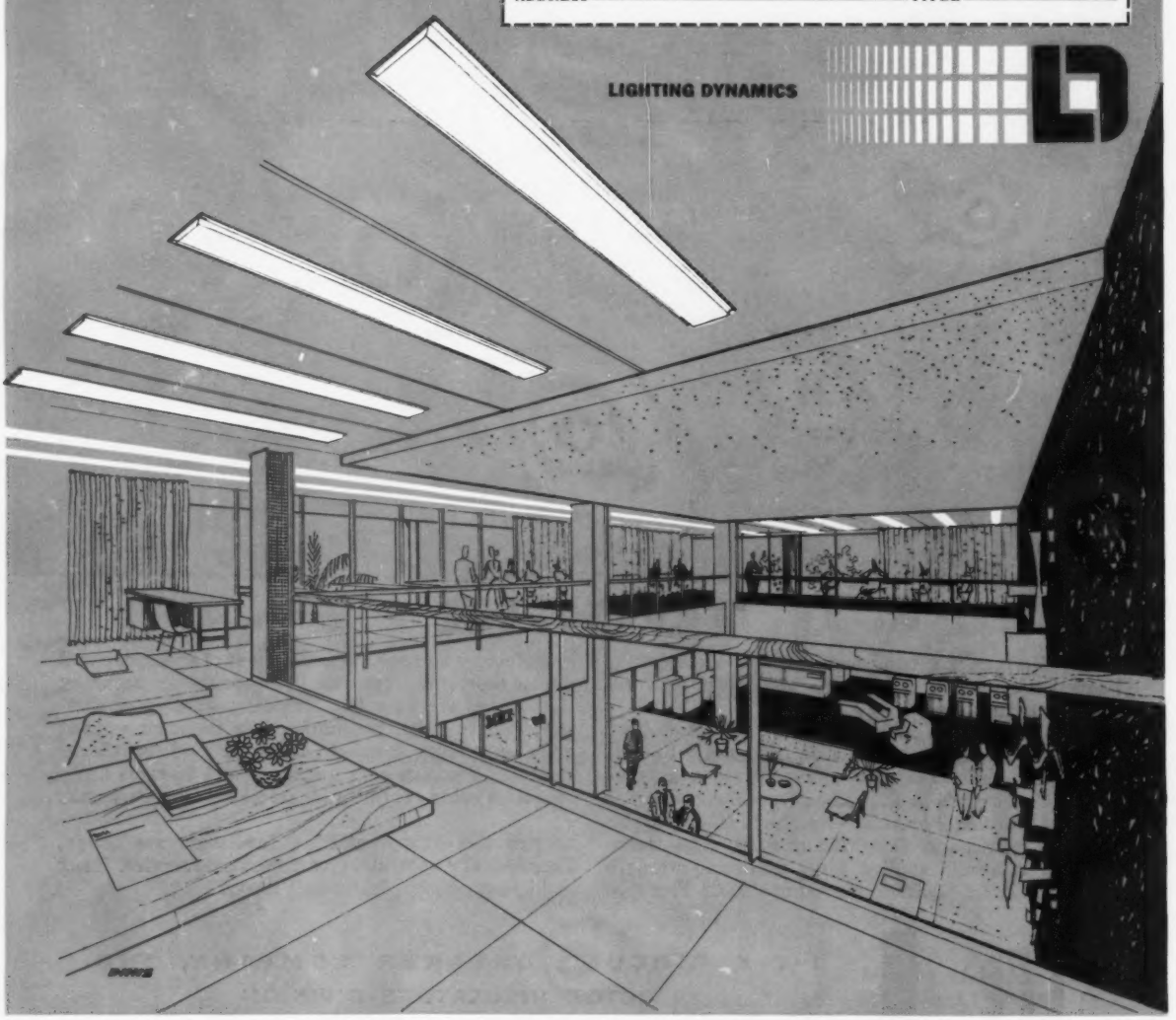

*ARGUS as it will be used in the IBM Western Headquarters Building designed by Pereira & Luckman.*

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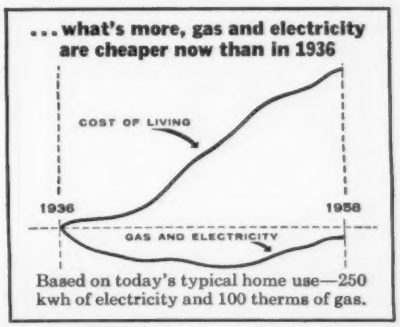
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# Yerk

A yerk is not a Scandinavian "square." It is a verb, meaning to think hard or to work hard. Most of us have to yerk all the time. A few seem to avoid yerking at all times. Unless you're married to the boss's daughter, however, you've probably yerked and yerked to get where you are.

That's why the electric industry's national "Live Better . . . Electrically," and "Full HOUSEPOWER" programs should interest you. A lot of smart people spent a lot of time and money yerking to create these two campaigns so that *you* wouldn't have to yerk as much.

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